

A Social Science Assessment of Conservation Practices in the Red River Basin of Minnesota

by

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EXECUTIVE SUMMARY

This report describes a social science assessment of conservation practices conducted in the Red River Basin, Minnesota. The study was conducted by the Department of Forest Resources, University of Minnesota in collaboration with the Northwest Regional Sustainable Development Partnership, University of Minnesota. The overarching goal of the study was to provide a science-based approach to understanding and promoting conservation practices in the Red River Basin. The specific study objectives were to (1) identify determinants of conservation practice adoption among agricultural producers in the Red River Basin, (2) better understand how conservation practices and determinants of adoption vary across subwatershed populations within the Red River basin (e.g., geographically, demographically, socially), and (3) to offer strategies for policy-makers, resource professionals and other local actors to best design and promote water resource programs that are ecologically, hydrologically, and socially relevant and responsive to changing conditions.

The project used a participatory, community-based approach using both qualitative data gathered through key informant interviews and focus groups and quantitative data collected through a landowner mail survey. In-depth interviews were conducted with 25 agricultural producers and/or landowners and focus groups were conducted with 15 local resource conservation professionals in two subwatersheds of the Red River basin: the Mustinka and South Branch of the Wild Rice. A self-administered mail survey was distributed to 1,500 landowners in Wild Rice River Watershed District and Middle Snake Tamarac Rivers Watershed District. At the time of publication of this report, 393 landowners had completed and returned the survey for a response rate of 28% (adjusted for 56 surveys returned undeliverable).

A brief synopsis of interview and survey findings are highlighted below.

Interview Findings

I. Agricultural Producer Interviewee Profiles

Twenty-five participants were interviewed in the two study watersheds. A diverse group of interview participants were recruited for participation in this study.

II. Conservation Practice Appraisal Process

The conservation practice appraisal process was anchored by seven evaluative queries (i.e., appraisal domains). These appraisal domains have multiple elements (i.e., dimensions) and details (i.e., descriptors), revealing a complex decision process framework. A brief synopsis of the appraisal domains are highlighted below.

1. Are others using the practice? Do others think I should use the practice?

Farmer conservation decisions are influenced by social influences including social pressures to act appropriately. Six dimensions/groups that influence farmers were identified:

- Farming community
- Government

- Corporations
- Resource conservation agencies
- Other farmers
- Landowners/renters

2. Am I morally obligated to use the conservation practice?

Personal or moral norms are a driver of conservation practices. Three dimensions of this domain were identified:

- Awareness and concern
- Sense of personal responsibility
- Stewardship ethic

3. Is my land/farm suitable for the practice?

Conservation practice suitability is a very practical, but critical appraisal tool. Three dimensions of practice suitability were identified:

- Parcel size
- Farm topography/slope
- Flooding risk/marginal land

4. Am I able to adopt and maintain the practice?

For many participants, having the resources and the skills or knowledge to implement and maintain a practice was a primary concern. Two dimensions of perceived behavioral control were identified:

- Resources including financial costs and time/labor requirements
- Skills, knowledge, and mastery

5. Will the practice achieve my desired outcomes?

Discussions of desired outcomes revealed scope of the desired outcome as an overarching dimension. In addition four primary dimensions were identified:

- Economic/productivity outcomes
- Ecological outcomes
- Social/cultural outcomes
- Psychological outcomes

6. Do I have control over the process of implementing and maintaining the practice?

Control over the decision making process, including implementing and maintaining a practice, appeared to be an extremely important appraisal domain. Three primary dimensions of procedural control were identified:

- Autonomy
- Flexibility
- Experimentation

7. Do I have control over the environment affecting the practice and its outcomes?

Control over the environment in the form of reducing investment and return uncertainty and managing risk also emerged as a primary conservation practice appraisal domain. Two primary dimensions of perceived environmental control were identified:

- Investment/return uncertainty
- Risk management

Survey Findings

I. Sociodemographic and Property Characteristics

1. Who are respondents and what are their property ownership characteristics?

- A vast majority of respondents in the watershed (84%) were male. About one-third of respondents (33%) had attained at least a college degree.
- Respondents' median age was 63.
- The vast majority of the respondents were white (95%) and not of Hispanic or Latino descent (99%).
- Almost two-thirds of respondents (65%) reported an annual household income of less than \$100,000. Respondents reported living 50 years in their community (median).
- Almost three-quarters of respondents (73%) reported using their land/property for agricultural production. Almost half of the respondents (47%) depend on their property for half their income or more.
- Almost half of the respondents (46%) own and manage their land. More than one-third of respondents rent land from another property owner (35%) and 16% of respondents rent land to another individual. Most respondents (56%) make their own decisions about how to manage their land.
- A vast majority of respondents (87%) reported owning or renting land with a stream or ditch located on or bordering their property.
- Most respondents (65%) own more than 151 acres.

II. Beliefs about Water Issues

2. What are respondents' beliefs about water quality?

- Most respondents (59%) reported that they were moderately to very familiar with water resource issues.
- More than half of respondents (58%) viewed water quality in the stream, ditch, lake or river closest to them as good to very good, while one-quarter of the respondents (25%) viewed water quality in the Red River as good to very good.

3. Are respondents concerned about the consequences of water pollution?

- A majority of respondents expressed concern about the consequences of excess water runoff for farmland (67%) and future generations (67%).
- The five pollutants/issues in the watershed rated on average as the biggest problems include flooding, soil erosion, sediment, pesticides, and herbicides.
- Overall respondents rated pollutants/issues such as flooding, soil erosion, and sediments and sources of pollutants/issues such as stream bank erosion, soil erosion from farmland, and wind erosion as the biggest problems in the watershed.

III. Current and Future Conservation Behaviors

4. Do respondents engage in conservation practices on their property?

- A majority of respondents reported following a comprehensive nutrient management plan (75%), protecting wetlands on the farm (80%), using conservation tillage practices (86%), and maintaining buffer/filter strips (79%) in at least one location on their farm.
- A vast majority of farmland owners (81%) reported they do not use drainage tiles on individual fields.

5. What civic actions have the respondents engaged in over the past 12 months related to environmental issues?

- The most commonly reported civic actions were volunteerism (59%) and talking to others about conservation practices (61%).
- A majority of respondents have never worked with other community members to protect water resources (72%), participated in water resource protection initiatives (73%), or taken a leadership role around water resource conservation in the community (81%) in the past 12 months.

6. What are respondents' intentions to engage in conservation actions to protect water resources in the future?

- Overall, a minority of respondents reported that they will talk to others about conservation practices (43%) in the next 12 months.
- One-third of respondents expressed uncertainty in their intentions to attend a meeting or public hearing about water (33%) or learn more about water resource issues in their watershed (33%). Similarly, more than one-third of respondents (38%) were uncertain whether they intend to work with other community members to protect water resources in the next 12 months.
- A majority of farmers/farmland owners reported that they probably or most certainly will use conservation tillage on the farm (61%) and maintain buffer/filter strips along all streams and ditches (52%) in the next 12 months.
- However, fewer farmers/farmland owners expressed similar intentions to learn more about conservation drainage management practices (41%) or to have land in conservation cover (38%).

IV. Perceived Constraints and Motivations for Conservation Behavior

7. Who influences respondents' conservation practices?

- Overall, respondents rated family as most likely to influence their decisions about conservation practices. Farmers, neighbors, county Soil and Water Conservation District, and local watershed district/watershed management organizations also were highly rated as influential in their decision-making.

8. Do respondents and their communities have the ability to protect water resources?

- Most respondents (78%) agreed that their use of a conservation practice contributes to healthy water resources.
- A majority of respondents (66%) agreed that they have the knowledge and skills to use conservation practices on their land.

- However, a minority of respondents (25%) agreed that they have the equipment (25%) or the financial resources (39%) they need to use a conservation practice. Similarly, about one-quarter of respondents agreed that their community has the financial resources (24%) and leadership (28%) it needs to protect water resources.

9. What would increase the likelihood that respondents would maintain conservation practices?

- A majority of respondents reported that they would be more likely to adopt or continue to use conservation practices on their land/property if conservation program requirements were less complex (59%).
- For most respondents, access to cost-share resources (63%) and higher payments for adopting conservation practices (59%) were most likely to increase adoption or continued use of conservation practices.

V. Attitudes toward Water Resource Management

10. What are respondents' attitudes toward management actions to protect the quality of water in Minnesota?

- Overall, more respondents expressed support for actions such as promoting voluntary adoption of conservation practices through education and outreach (65%), streamlining existing programs that offer financial incentives to property owners/farmers for conservation (67%), and expanding programs that offer financial incentives to property owners/farmers for conservation practices (66%) than any other action listed.
- Overall, more respondents expressed opposition for actions such as increasing land use laws and regulations (52%) and enforcing existing land use laws and regulations (23%) than any other action listed.

VI. Respondent Subgroup Comparisons

11. How do respondents in Wild Rice and Middle Snake Tamarac Rivers watersheds vary in their water resource perspectives?

- There were no significant differences between respondents in Middle Snake Tamarac Rivers Watershed District (MST) and Wild Rice River Watershed District (WR) in their socio-demographic and property characteristics, except in gender. Female respondents are better represented in MST (23%) than in WR (12%).
- Highly significant differences were identified between MST and WR respondents in perceived constraints, motivators of conservation, social influences, and current use of practices.
- Higher payments for adopting conservation practices was a significant motivator for MST respondents.
- Availability of financial resources in their community was a significant constraint for MST respondents.
- MST respondents reported being influenced to a greater extent by 8 out of the 20 individuals/groups listed than did WR respondents.
- MST respondents also reported using three out of nine practices in more locations than WR respondents.

12. How do respondents who own small and large properties vary in their water resource perspectives?

- There were no significant differences between small (fewer than 300 acres) and large (300 acres or more) landowners in socio-demographic characteristics.
- However, a greater proportion of large landowners (58%) use their land for agricultural production than small landowners (42%).
- Some notable differences were identified between small and large landowners in perceived constraints, motivators of conservation, social influences, current use of practices, and past civic engagement.
- While knowledge, skills, and equipment were constraints for small landowners, community ability to work together to change land use practices was a significant constraint for large landowners.
- Small and large landowners also differed in 7 out of 20 motivators of conservation.
- Large landowners were influenced to a greater extent than small landowners by 6 out of 20 individuals/groups listed.
- Large landowners reported using three out of nine practices in more locations than small landowners.
- Large landowners also reported higher levels of past civic engagement than small landowners.

13. How do respondents with varying levels of percent agricultural income (i.e., low vs. high) differ in their water resource perspectives?

- There were no significant differences between respondents with low percent agricultural income (LPA) (less than 50% of income dependent on agricultural production) and high percent agricultural income (HPA) (50% or more income dependent on agricultural production) in socio-demographic characteristics with the exception of education. A greater proportion of LPA respondents had some college or graduate work (76%) or a graduate degree (76%) than did HPA respondents (24%) (**Table 32**).
- HPA and LPA respondents also differed in two property characteristics: use of land for agricultural production and property size. A greater proportion of HPA respondents (58%) than LPA respondents (42%) use their land for agricultural production. On average, HPA respondents (Mean = 750 acres) also own more land/property than LPA respondents (Mean = 237 acres).
- Some notable differences were identified in HPA and LPA respondents' perceived constraints, motivators of conservation, social influences, current use of practices, and past civic engagement.
- While knowledge and skills were a significant constraint for LPA respondents, equipment needed to adopt a new conservation practice was a more significant constraint for HPA respondents.
- While learning about the wildlife benefits of conservation practices were more likely to influence LPA respondents' decisions to use conservation practices, HPA respondents were more likely to use conservation practices if they were compensated for lost crop production and if conservation program requirements were less complex.
- HPA respondents were influenced to a greater extent than LPA respondents by 7 out of 20 individuals or groups listed.
- HPA respondents reported using two out of nine practices in more locations than LPA respondents.
- HPA respondents also reported higher levels of past civic engagement than LPA respondents.

Discussion

I. Conservation decision making is a community-based process.

Interview and survey findings reveal that landowner and agricultural producers' conservation decision making is influenced by various individuals and groups including family, neighbors, and agricultural professionals. Thus, conservation programming should continue to bring these individuals and organizations into the fold. Promoting informal and formal exchange and interaction among and between these stakeholders and using consistent messaging will be important intervention strategies.

II. Multiple capital and capacity constraints to conservation action exist.

The biggest constraints to water resource conservation appear to be equipment, community financial resources, community leadership, and personal financial resources. However, perceived constraints vary by location in the watershed, property size, and percent agricultural income. Leadership development programs, technical assistance and training, equipment rental and trial programs, and forums that bring larger landowners together appear to be worthy investments.

III. Conservation program reformation, increased financial incentives, and soil conservation are primary drivers of conservation action.

The biggest drivers of water resource conservation appear to be reducing the complexity and increasing consistency of conservation programs, access to cost-share resources, higher payments for adoption, evidence that conservation practices improve water resources, and compensation for lost crop production because of conservation practices. Again, survey respondent motivators varied by location, property size and percent agricultural income.

IV. Beliefs, social influences, and conservation action vary by watershed location, land ownership size, and percent agricultural income.

Upstream and downstream landowners vary in perceived constraints, motivators, social influences, and conservation practices. Survey and interview analysis suggests that upstream and downstream landowners and farmers have somewhat different perspectives and worldviews on water resource conservation. Similarly, smaller and larger landowners and landowners with higher and lower proportions of agricultural income differ in perceived constraints, motivators, social influences, conservation practices, and civic engagement.

PROJECT BACKGROUND

This report describes a social science assessment of conservation practices conducted in the Red River Basin (RRB) area of Minnesota. The study was conducted by the Department of Forest Resources, University of Minnesota in collaboration with the Northwest Regional Sustainable Development Partnership. Private landowners throughout the Red River Basin have established conservation practices on hundreds of thousands of acres. These actions provide important benefits to the region including reduced flood damages, improved water quality, and enhanced wildlife habitat. Over the next five years, due to high commodity and land prices, it is expected that many thousands of acres of land currently enrolled in conservation programs such as the Conservation Reserve Program (CRP) will be converted back to cropland. This conversion will result in a large loss of conservation benefits. At the same time that these losses are expected, the Natural Resource Conservation Service (NRCS) expects up to \$5 million per year in additional funding for conservation programs to target flood damage reduction benefits. This project offers a much needed science-based approach to understanding and promoting conservation practices in the RRB. Despite advances in biophysical science, technology, and engineering, water resource managers continue to struggle with fundamental questions in the implementation of water resource management strategies. This study helps provide resource professionals with a better understanding of what drives and what serves as barriers to conservation practice adoption at individual landowner and broader watershed community scales.

The overarching goals of the study were to provide a science-based approach to understanding and promoting conservation practices in the Red River Basin. The specific study objectives were to (1) identify determinants of conservation practice adoption among agricultural producers in the Red River basin, (2) better understand how conservation practices and determinants of adoption vary across subwatershed populations within the Red River basin (e.g., geographically, demographically, socially), and (3) to offer strategies for policy-makers, resource professionals, and other local actors to best design and promote water resource programs that are ecologically, hydrologically, and socially relevant and responsive to changing conditions. Data were gathered through a series of in-depth interviews with 25 agricultural producers and/or land owners in two subwatersheds of the Red River basin, the Mustinka and South Branch of the Wild Rice, and through focus groups with 15 local agency personnel also in the subwatersheds. Data were also collected through a self-administered mail survey of landowners in two subwatersheds of the Red River basin: Wild Rice River and Middle Snake Tamarac Rivers watershed.

Developing a better understanding of the motivations and attitudes that landowners and producers have toward conservation and water management will help ensure that conservation funds are used effectively in the future to retain current lands and better target implementation of practices on new lands. The information provided in this report is intended to inform, enhance, and facilitate future community water resource planning and management initiatives in the Red River Basin. Study findings will be useful for designing conservation initiatives and outreach and education programs that respond to the unique needs and concerns of agricultural producers and land owners in the area. This assessment project will supplement existing bio-physical and technical knowledge with a deeper

understanding of the factors influencing the conservation behavior of the farmers and land owners of the Red River Basin.

STUDY DESIGN AND METHODS

The project used a participatory, community-based approach using both qualitative data gathered through key informant interviews and quantitative data through self-administered surveys. Qualitative data were gathered through in-depth interviews with agricultural producers and land owners as well as focus groups with local agency personnel. Quantitative data were collected through a self-administered mail survey distributed to 1,500 landowners in Wild Rice River Watershed District and Middle Snake Tamarac Rivers Watershed District.

This project was driven by three primary research questions of particular relevance to water resource management in the Red River basin:

- 1) What are determinants of conservation practice adoption among agricultural producers in the Red River basin? Specifically, what psychological, social, and institutional factors serve as drivers, constraints, and barriers that influence adoption?
- 2) How do conservation practices and determinants of adoption vary across subwatershed populations within the Red River basin (e.g., geographically, demographically, socially)?
- 3) How can policy-makers, resource professionals, and other local actors best design and promote water resource programs that are ecologically, hydrologically, and socially relevant and responsive to changing conditions?

Research question one was addressed primarily using qualitative data, while research question two was addressed primarily using quantitative survey data. Results from both methods helped inform research question three.

Red River Basin

This study was conducted in the Red River Basin, Minnesota. The Red River flows north in a wide, flat valley through Minnesota, South and North Dakota, and into Lake Winnipeg in Manitoba, Canada (Appendix A). Two specific study watersheds were selected by project partners and the Project Advisory Team (PAT), a group of stakeholders in the study area that provided input on study design and implementation and received updates on the project. The Mustinka River watershed and the South Branch of the Wild Rice watersheds (Appendix C) were selected by project partners and the PAT as representative of varying agricultural, geographic, and hydrologic conditions in the basin.

Interview and Focus Group Methods

Qualitative data were gathered through in-depth interviews with agricultural producers and land owners as well as focus groups with local agency personnel in two watersheds: Mustinka River watershed and Wild Rice River watershed. Mustinka River watershed drains 562,112 acres of land primarily used for agricultural purposes (86%), nearly all row cropping (Minnesota Pollution Control Agency, 2012). A 2013 report by the Minnesota Pollution Control Agency (MPCA) list the primary crops in the watershed as corn, soybeans, sugar beets, and small grains, and notes that while 97% of the area is privately owned, only 5% of land in the district is designated for residential land use (Dollinger, et al. 2013). Communities

in the Mustinka watershed include: Elbow Lake, Graceville, Norcross, and Wheaton. Flooding and aquatic environment impairments are issues of primary concern due to a relatively flat topography, broad floodplains, and extensive landscape modifications to accommodate row cropping, such as ditching and stream channelization (Dollinger, et al. 2013). The same MPCA report documents extensive ditching and draining efforts that have occurred since agricultural activities began in the area to address the impacts on crop production of water retention on the land. These efforts have accelerated in recent years with estimates of well over 3,000 miles of drain tile permitted since 2009, and resulting in significant alterations to the natural hydrological systems (Dollinger, et al. 2013).

At approximately 2,080 square miles, the Wild Rice watershed is the third largest in the Red River Basin (Red River Watershed Management Board). Communities in the Wild Rice watershed include: Ada, Ulen, Twin Valley, and Mahomen. Portions of the White Earth Nation are also included in the watershed. Agriculture is the primary land use with over 60% of the acres in the area in agricultural production. The main resource concerns in the watershed are “erosion, nutrient management, wetland management, surface water quality, flood damage reduction, and wildlife habitat” (Minnesota Pollution Control Agency, 2011).

An interview guide (Appendix G) was developed in collaboration with project managers and members of the PAT intended to gain a better understanding of agricultural producer’s motivations around conservation decision making and their understanding of conservation issues. Local agency professionals in each of the two study watersheds were contacted (Appendix D) in order to develop an initial set of potential interviewees. Individuals on the list were contacted (Appendix E) to gauge their interest in participating in the study, and times were set for interviews with willing participants. During the interview, the interviewer used a checklist of potential conservation practices (Appendix I) to guide the questions related specifically to the participants’ knowledge and perceptions of these items. This list was developed by the PAT in consultation with researchers working on the project. These practices include incentive and regulatory based measures. There are also practices which are neither incentive nor regulatory based but which have both direct and tangible benefits to the farmer and are conservation oriented (i.e. no-till/low-till).

Twenty-five semi-structured interviews were administered with individuals, 12 interview sessions in each watershed, with one session in the Wild Rice watershed having two participants. 10 interviews occurred in December of 2012 with the remaining in March and April of 2013. Participants were selected through a snow ball sampling approach beginning with a list of potential participants from local resource professionals and building a progressively larger list through referrals from those individuals. This method was selected for the study to best find both male and female agricultural producers and/or land owners who represented a variety of ages with different farm sizes, adoption rates of BMPs, and attitudes towards conservation practices. Most of the interviews occurred in the individuals’ homes, although some opted to meet at public establishments (bowling alley, senior center, local coffee shop, etc.). Participants were offered \$50.00 as an incentive to participate. Each individual signed a consent form prior to the start of the interview (Appendix F) and the interviewer emphasized that participation was voluntary and that every reasonable effort would be made to make sure confidentiality was maintained. The interviewer also answered any questions the interviewee had prior to beginning the interview. After working through the questions in the guide, participants were asked to complete a participant background information sheet (Appendix H). This information was used to help understand the participating population more fully and will not be publically linked with the interview responses.

Two focus group sessions were administered in summer 2013 with local agency professionals with one session in each of the study watersheds. The intent of the focus groups was to triangulate methods and further explore conservation decision making and water resource issues from a resource professional perspective, as well as gather additional input regarding the motivations of agricultural producers' conservation decision making. Focus group participants included Soil and Water Conservation District staff, Natural Resources Conservation Service staff, and watershed district staff from the Mustinka River Watershed and Wild Rice River Watershed. A list of potential participants was compiled and reviewed by members of the PAT. Once the list was finalized, participants were contacted using a set script similar to the one used in the interview process which explains the intent of the project and the focus groups. An agenda was set for the events to guide the proceedings with assistance from other members of the research team. Each participant was asked to complete a consent form prior to the start of the focus group as well as a background information sheet prior to the conclusion of the event. The focus group included a brief presentation summarizing findings to date, as well as time for discussion on the issue of agricultural producers and conservation practices. A "clicker exercise", using an immediate response technology that displays respondent's combined replies to questions was used to gather additional information and as a technique to facilitate discussion around topics of interest.

Qualitative data were analyzed both through focused coding aimed at addressing the project research questions as well as through a grounded theory approach. Analysis was performed using QRS International's Nvivo 10 software to manage the collection and analysis of the data. The coding schema development process included occasional checks for consistency and applicability from a team of researchers familiar with the study.

The goal of the study was not to statistically represent the opinions of the entire study watershed population or the perspectives of all the agricultural producers or landowners within the study communities. Thus, the opinions of all residents or decision makers have not been captured. While clearly not every value and belief system is represented in this study, a wide range and diverse set of opinions have been captured. Study participants have different backgrounds, experiences, and connections to community, farming practices, and water. They were identified as being knowledgeable about community and/or having a diverse perspective on the use of agricultural best management practices. Importantly, this study documented the perspectives of members of traditionally underrepresented groups of stakeholders in water resource management—racial and ethnic minority groups. Again, we only spoke to a few experts within a few of these groups. While study findings may not be generalizable to all agricultural watershed populations, we believe study findings provide important insight about community members and community engagement in similar sociocultural contexts and biophysical settings.

Survey Methods

The study was conducted through a self-administered survey of a random sample of landowners in the Wild Rice River and Middle Snake Tamarac Rivers Watershed Districts. These watersheds are part of the Red River Basin. The Wild Rice River Watershed District boundaries include portions of the Eastern Wild Rice River watershed and the Elm-Marsh Rivers watershed. The district stretches across Norman, Clay, Becker, Mahanomen, Clearwater, and Polk counties (see map in Appendix K). The Middle Snake Tamarac Rivers Watershed District includes portions of the Middle River, Snake River, and Tamarac River watersheds. The district stretches across Marshall, Polk, Pennington, Kittson, and Roseau counties (see map in Appendix L). The surveys were administered from March through June 2014.

A list of property owners within the two study watersheds was obtained from publicly available property tax records. County tax records were obtained from Becker, Clay, Norman, and Polk counties in Wild Rice River Watershed District and from Kittson, Marshall, Pennington, and Polk counties in Middle Snake Tamarac Rivers Watershed District. Mahnommen and Clearwater counties in Wild Rice River Watershed District and Roseau county in Middle Snake Tamarac Rivers Watershed District were excluded because property tax records could not be obtained from these counties. The list was reduced to a sampling pool of property owners owning 40 acres or more. A random sample of 750 landowners from each of two watershed districts was selected, thus resulting in a final sample of 1,500 landowners. At the time of publication of this report, 393 landowners had completed and returned the survey for a response rate of 28% (adjusted for 56 surveys returned undeliverable) (Appendix Q, Table 1).

Survey instruments were designed based on an extensive literature review and feedback from a pilot test of the instrument. The survey questionnaire included a variety of fixed-choice and scale questions. Several questions were adapted from survey instruments used in previous studies of attitudes, beliefs, and values of conservation behaviors (Blasczyk, Your views on local water resources, 2010; Harland, Staats, & Wilke, 2007; Matsumoto, Weissman, Preston, Brown, & Kupperbusch, 1997; Prokopy et al., 2009; Schultz, 2001; Schwartz, 1977; Stern, Dietz, & Guagnano, 1998; Stern, Dietz, & Kalof, 1993; Seekamp, Davenport, & Brehm, Lower Kaskaskia River Watershed Resident Survey, 2009). Each questionnaire was labeled with a unique identification number to track responses for subsequent mailings.

An adapted Dillman's (2009) Tailored Design Method was used to increase response rates. The survey was administered in three waves: (1) the questionnaire (Appendix M) with a cover letter (Appendix N), watershed map, self-addressed, business reply envelope, and a cash incentive (\$2 bill); (2) a replacement questionnaire with a reminder letter (Appendix O), watershed map and envelope; and (3) a third replacement questionnaire with cover letter (Appendix P), watershed map and envelope. Importantly, this report was written after 3 waves of mailing to the Wild Rice River watershed sample and 2 waves of mailings to the Middle Snake Tamarac Rivers watershed sample.

Returned questionnaires were logged into the respondent database. Response data were numerically coded and entered into a database using Statistical Package for Social Sciences (SPSS release 19.0). Basic descriptive statistics were conducted to determine frequency distributions and central tendency of individual variables. Inferential statistics also were conducted to test for significant differences between respondent subgroups. Subgroup comparisons were conducted between watersheds (i.e., Wild Rice and Middle Snake Tamarac Rivers watersheds), size of property ownership (i.e., small, including respondents owning fewer than 300 acres, and large, including respondents owning 300 acres or more), and levels of percent income dependent on agricultural production (i.e., high, including 50% of total income or more, and low, including less than 50% of total income). Respondent subgroups were compared for differences in their socio-demographic (survey questions 30, 31, 32, 33, 34 and 35) and property characteristics (survey questions 12, 24, 28, 29), perceived ability (survey question 12), motivators of conservation (survey question 20), individual or group influence on conservation decisions (survey question 18), current use of practices (survey question 14), and civic engagement (survey question 15).

STUDY FINDINGS

Study findings are organized into two sections: interview findings and survey findings. Interview findings are further organized into two sub-sections: agricultural producer interviewee profiles and conservation practice appraisal process. The second sub-section responds to seven unique research questions. The survey findings are organized into six sub-sections that respond to 13 unique research questions.

Interview Findings

I. Agricultural Producer Interviewee Profiles

The 25 interview participants were asked a series of basic socio-demographic questions, as well as questions about their farms management and operations, and adoption of best management practices (BMP). Interview participants represent diverse socio-demographic characteristics with varying farm sizes, ownership arrangements, level of BMP adoption, and income levels. Interview participants' age ranged from 28 to 80. A majority of the interviewees were males. However, two female participants were interviewed in each sub-watershed. Most of the participants had lived in the community and had worked as a farmer for large portions, if not all, of their lives (Table 1). Additionally, most of the participants had a combination of owned and rented land that they farmed and most earned more than 50% of their household income from the farming operation (Table 2). Farm operation sizes ranged from just over 200 acres to 6,500 acres (Table 3). Conservation tillage and use of cover crops were the most frequently adopted BMPs, while practices more closely related to livestock ag waste management and rotational grazing, and terracing were least frequently adopted (Table 4).

Table 1. Interview participant profile

Socio-Demographic	Mustinka River	Wild Rice River
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Characteristics		Watershed		Watershed	
		N	Percent	N	Percent
Gender	Male	10	83	11	85
	Female	2	17	2	15
Age	Median	60	-	60	-
	Minimum	33	-	28	-
	Maximum	80	-	71	-
Years lived in community	Median	45	-	53	-
	Minimum	11	-	6	-
	Maximum	88	-	70	-
Years farming	Median	27	-	40	-
	Minimum	4	-	6	-
	Maximum	62	-	56	-
Formal education	Did not finish high school	0	0	0	0
	Completed high school	4	33	3	23
	Some college but no degree	2	17	6	46
	Associate or vocational degree	0	0	2	15
	College bachelor's degree	5	42	1	8
	Some college graduate work	0	0	0	0
	Completed graduate degree (MS or PhD)	1	8	1	8
Household income	Under \$34,999	0	0	0	0
	\$35,000-\$49,999	1	8	2	15
	\$50,000-\$74,999	3	25	1	7
	\$75,000- \$99,999	2	17	0	0
	\$100,000-\$149,999	3	25	5	39
	\$150,000 or more	3	25	5	39

Table 2. Interview participant property characteristics

Property Characteristics	Mustinka River watershed	Wild Rice River watershed
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		N	Percent	N	Percent
Percent income dependent on farming	0%	0	0	1	8
	1-25%	0	0	0	0
	26-50%	2	17	1	8
	More than 50%	10	83	11	84
Ownership arrangement	I own and manage my own land	0	0	2	15
	I rent my land <u>to</u> another party	0	0	3	23
	I rent my land <u>from</u> another party	0	0	1	8
	I own/manage and rent from another party	8	67	3	23
	I own/manage and rent to another party	3	25	4	31
	Other	1	8	0	0
Years farm has been in the family	Median	74	-	61	-
	Minimum	11	-	19	-
	Maximum	132	-	120	-
Distance farm is from home (miles)	Median	5	-	0	-
	Minimum	0	-	0	-
	Maximum	15	-	30	-

Table 3. Interview participant farm size

Property size	Mustinka River watershed			Wild Rice River watershed		
	N	Percent	Mean	N	Percent	Mean
Under 500 acres	8	67	1,716	4	31	2,246
501-1000 acres	3	25		0	0	
1001 or more acres	1	8		9	69	

Table 4. Interview participant reported adoption of best management practices

Best management Practice	Mustinka River watershed (N)	Wild Rice watershed (N)
Conservation Cover	10	6

Conservation Tillage	12	10
Buffer/filter strips	9	9
Terraces	1	0
Side water inlets	3	3
Water/sediment control basins	2	4
Drainage water management	3	3
Wetlands	4	5
Ag waste management	1	1
Rotational grazing	1	3
Total	47	44

II. Conservation Practice Appraisal Process

The conservation practice appraisal process in some cases included very deliberate contemplation of the practice and in other cases was characterized by more instinctive or quick judgments about the practice. Whether consciously and effortful or subconsciously and hasty, the decision process was anchored by seven evaluative queries (i.e., appraisal domains). These appraisal domains have multiple elements (i.e., dimensions) and details (i.e., descriptors), revealing a complex decision process framework (Table X).

1. Are others using the practice? Do others think I should use the practice?
2. Am I morally obligated to use the conservation practice?
3. Is my land/farm suitable for the practice?
4. Am I able to adopt and maintain the practice?
5. Will the practice achieve my desired outcomes?
6. Do I have control over the process of implementing and maintaining the practice?
7. Do I have control over the environment affecting the practice and its outcomes?

1. Are others using the practice? Do others think I should use the practice?

Data analysis revealed that farmer conservation decisions are influenced by social influences including social pressures to act appropriately from landowners/renters, other farmers, the farming community, agricultural corporations, resource conservation agencies, and local government. Social norms also emerge as observations, communication, and social guidance on the benefits or risks of specific actions.

Comments like, “If other guys are doing it” suggest that trends within the farming community do influence farmer action. Similarly, another participant noted, “We talk to neighbors who have done it. Like there is a field really close by, and so we can probably take that example. See what his experiences are...and then make the decision from there.” Another participant described informal knowledge exchange between farmers: “Yes, informal talk: farmers always pull up in each other’s farms and visit and see what’s going on. And, usually you can see what other people are doing, and then you start asking questions about what’s up.”

A few participants described an absence of a social norm around conservation practices, which in some cases, has led to social conflict: “It’s happening within the community now and it, it can put neighbor against neighbor without, without a firm set of rules in place which right now there isn’t.” Several participants contemplated the role of government and natural resource agencies in regulating

agricultural production. Trust in local agencies emerged as an important constraint or driver for conservation: “The watershed [district]. Well, sometimes I question their willingness to understand the situation and give recommendations that are beneficial to the area.” A few participants acknowledged a need for regulatory control. For example, one participant suggested that farmers are too independent to work together in drainage management.

I think the only people that can be [responsible for conservation is] the government. It was proven many, many times that farmers can't get together. They're just too independent. If what I think is different than what my neighbor thinks... We all get along out here fine, don't get me wrong, but if I went out and said that I want to keep more water in that slough I've been talking about, I would maybe get half of them to go with me and the other half wouldn't.

2. Am I morally obligated to use the conservation practice?

Personal or moral norms are driver of conservation practices if an individual is aware of, concerned about, and feels personally responsible for the consequences of impaired water resources. Moral obligation parallels a conservation ethic, which a few farmers explicitly described as the reason they use conservation practices. Personal norms of conservation were not ubiquitous in the sample of farmers interviewed. However, for those who characterized conservation “as the right thing to do,” this moral obligation appeared to be a chief driver of conservation action. One participant described stewardship as his religious obligation: “The Lord only is lending us this land for us to take care of it, we're just stewards and I hope we leave it in better condition for the next generation.” Another participant felt responsible for problems downstream: “We want to stop the erosion along the cricks and streams.... It is the beginning of the problem all the way to Winnipeg. This is where the watershed starts.”

3. Is my land/farm suitable for the practice?

Conservation practice suitability is a very practical, but critical appraisal tool. Participants identified practices that were very appropriate or inappropriate for their fields. Parcel size, farm topography/slope, and flooding risk were important dimensions of practice suitability. For example, marginal lands or flood-prone lands were suitable for conservation: “It was land that the potential for flooding was high on it and I'd rather put it in CRP than have some younger fellow take the chance to grow something on it.” In other instances, participants perceived certain practices are not suitable: “I don't think here you will see [terracing]. We are too flat. I mean I guess that's where I am at. I don't see anything around here.”

4. Am I able to adopt and maintain the practice?

For many participants, having the resources and the skills or knowledge to implement and maintain a practice was a primary concern. Resources including financial, time, labor, and equipment were among the constraints participants identified. For example, one participant no longer uses a cover crop because of financial burdens: “We have had summer fallow to rest the land and then maybe plant some alfalfa or some other cover cropped kind of nurtured back, but you can't, we did this quite often before but you can't do it anymore because you can't make it financially. You are just, you are using every acre of land to its fullest.” Evidence of a basic farmer value—the pursuit of mastery—also emerged in this discussion.

For many farmers mere implementation is not the goal; rather, mastering the practice to reach desired outcomes is the goal. Technology solutions align well with this worldview. For example, one participant described how chemical use has changed making pesticides safer:

We used to put things down like atrazine, because we had to fight the weeds. But as you learn more about it, that's not a good deal. You're putting it down in the soil, it never leaves, it goes down into the underground water source. Since Roundup products came out and some of these gene modifications, we're not putting pesticides down like we used to. We're putting Roundup down, which is neutralized by soil. It's a lot less than it was. When I was in my younger years, wow, it's amazing I survived it. We sprayed a lot of pesticides, a lot of harsh chemicals. Now we're just not.

Another participant saw conservation practices as a way to streamline work and to reduce labor needs: "There is not a lot of, the work force is not there anymore like it used to be. So if a guy can find some other techniques that don't take as much labor, it is something to look at. That's my take on it anyway."

5. Will the practice achieve my desired outcomes?

This appraisal domain garnered a lot of conversation and varying beliefs and attitudes. Discussion of desired outcomes revealed four primary dimensions: economic/productivity outcomes, ecological outcomes, social/cultural outcomes, and psychological outcomes. A fifth overarching dimension is the scope of the desired outcomes. Some individuals had a narrow vision of outcomes they desired, hinging on productivity and profit: "I am not doing it if it's reducing yield." Several participants described "getting every bit out of every acre" or "using every acre of land to its fullest." The desire for compensation for taking land out of production was commonly expressed:

The biggest obstacles right now is the price, the price of land. I mean every farmer is trying to get every bit out of every acre, and that's the biggest obstacle and the only way that one's going to be alleviated is [the government's] going to have to pay. Like to give up an acre of land—since you can't go out and find another acre of land—you're going to have to pay more of them the 100 percent. ...You've got to work around stuff. You've got to work with rules, and you've got to be compensated for it.

Similarly, one participant talked about being compensated for downstream benefits of conservation upstream: "If we're going to hold water, you're going to have to get paid... If somebody else is benefitting from it, then their savings has to be put back to you somehow. "

Others advocated a broader vision which included ecological, social, cultural, and/or psychological outcomes. Despite the predominating perspective that economics and efficiency are the bottom line, several participants very clearly described multiple benefits of conservation. For example, one participant finds the wildlife benefits of conservation "rewarding:"

... So I mean, if it is of an economic advantage, yeah, it really makes sense then. Yeah, that was a no brainer. ... But that's kind of rewarding too, because it is another spot for wildlife. It's two things: it will keep that crick from washing that bank out hopefully, and will be a place for some water hopefully, for a while.

6. *Do I have control over the process of implementing and maintaining the practice?*

Control over the decision making process, including implementing and maintaining a practice, appeared to be an extremely important appraisal domain. Autonomy, flexibility, and experimentation, in particular, were significant dimensions of control. Resource conservation agency programs were commonly characterized as complex, rigid, and slow: “It just seems like no matter what you try to do to help alleviate the problem, you run into bureaucracy with other agencies. That’s a big problem and I don’t see how they overcome it.” Several participants described the need to experiment with conservation and not be committed to a specific practice or program requirement over a long period of time.

For some participants, non-local control over conservation programs and decision making was a major concern. One participant described feeling powerless in a meeting with state and federal agencies:

Well, you got 10 different agencies sitting there all the way from well, Fish and Game and DNR and the whole gamut of them. They’re all people sitting there getting paid to do this. I mean some drive down from the Cities. It’s a nice day, 2 day trip for them to come down and sit there. They’re getting paid [and] we have to take the time off to farm to go up there and we have no power in that meeting, because we haven’t got no official papers. I mean, it’s stacked up against you. It’s just completely stacked against you.

In contrast, another participant described the need for government control and the farm program to protect sensitive ecosystems: “If there was no government control? Was no farm program? There wouldn’t be a wetland left. Every wetland would be farmed. That’s the biggest thing I mean, and it would all be farmed.”

7. *Do I have control over the environment affecting the practice and its outcomes?*

Control over the environment in the form of reducing investment and return uncertainty and managing risk also emerged as a primary conservation practice appraisal domain. Control, uncertainty, and risk were common topics of conversation either implicitly or explicitly. One participant believed the success of the farm is not something that can be controlled: “I mean, it’s all land prices and land rent and stuff that really isn’t in your control anymore.” Similarly another participant described the uncertainty of climate and weather as a concern when deciding to implement conservation practices: “You can’t control Mother Nature; so ...I guess you just do the next best things that you can.” Finally, one participant suggested his philosophy on managing risk and characterized conservation decisions as high stakes propositions because of the need to maintain a family legacy: “It’s our livelihood, and it’s really, [you] don’t want to screw up, because it is a family farm. So you don’t want to mess up and do something wrong where you lose it, you know.”

Table 5. Conservation Decision Process Framework

Domains	Dimensions	Descriptors
Am I morally obligated to use the conservation practice? (Personal or moral norms)	Awareness and concern	<ul style="list-style-type: none"> • Awareness & concern for downstream impacts • Lack of awareness & concern for downstream impacts
	Sense of personal responsibility	<ul style="list-style-type: none"> • Urban/rural conflict over pollutant source • Upper/lower watershed conflict over who should pay/benefit • Shared responsibility • Private property rights reduce landowner responsibility • Sense of personal responsibility
	Stewardship ethic	<ul style="list-style-type: none"> • General ethical considerations
Are others using the practice? Do others think I should use the practice? (Social norms & influences)	Farming community	<ul style="list-style-type: none"> • Farming cultural changes • Competition • Farm size increases • Farmer independence & lack of communication • Leadership in conservation
	Government	<ul style="list-style-type: none"> • Trust/distrust in local government • Leadership in conservation
	Corporations	<ul style="list-style-type: none"> • Leadership in conservation
	Resource conservation agencies	<ul style="list-style-type: none"> • Trust/distrust in resource conservation agencies • Resource conservation agency leadership & influence in conservation
	Other farmers	<ul style="list-style-type: none"> • Interactions/knowledge exchange with other farmers • Maintaining practices of previous farmer • Observing success on other farms • Leadership in conservation
	Landowner/renter	<ul style="list-style-type: none"> • Landowner/renter influence in conservation
Is my land/farm suitable for the practice? (Practice suitability)	Parcel size	<ul style="list-style-type: none"> • Too small for conservation
	Farm topography/slope	<ul style="list-style-type: none"> • Too flat for conservation
	Flooding risk/marginal lands	<ul style="list-style-type: none"> • Flooded/marginal lands suitable for conservation
Am I able to adopt and maintain the practice? (Perceived behavioral control)	Resources	<ul style="list-style-type: none"> • Financial costs of implementation & maintenance • Financial assistance with implementation & maintenance • Technical assistance with implementation & maintenance • Technology enhancements • Time/labor requirements
	Skills, knowledge, & mastery	<ul style="list-style-type: none"> • Education and outreach programs build knowledge & skills

Domains	Dimensions	Descriptors
Will the practice achieve my desired outcomes? (Perceived self-efficacy)	Scope of desired outcomes	<ul style="list-style-type: none"> • Singular focus on maximizing yield/profit • Multiple desired outcomes
	Economic/productivity outcomes	<ul style="list-style-type: none"> • Drainage problems • Impacts to yield • Labor costs • Financial incentives • Soil conservation • Minimizing inputs • Larger farms/corporate farms focus on efficiency rather than multiple outcomes
	Ecological outcomes	<ul style="list-style-type: none"> • Soil conservation • Impacts of chemical use • Erosion control • Aesthetics • Water quality benefits • Wildlife benefits
	Social/cultural outcomes	<ul style="list-style-type: none"> • Innovativeness, mastery, and leadership • Personal/family health & wellbeing • Downstream benefits • Flood control/drainage management • Way of life/cultural legacy
	Psychological outcomes	<ul style="list-style-type: none"> • Enjoyment • Personal legacy • Consistency with religious/spiritual beliefs
Do I have control over the process of implementing and maintaining the practice? (Perceived procedural control)	Autonomy	<ul style="list-style-type: none"> • Land management and decision making (renter, landowner, absentee landowner) • Resource conservation agency authority and jurisdiction
	Flexibility	<ul style="list-style-type: none"> • Regulations (new & changes) • Government programs/requirements add complexity, rigidity, slow process
	Experimentation	<ul style="list-style-type: none"> • Experimentation with new practices
Do I have control over the environment affecting the practice and its outcomes? (Perceived environmental control)	Investment/return uncertainty	<ul style="list-style-type: none"> • Input/commodity prices • Land /rental prices • Weather and climate • Weed management
	Risk management	<ul style="list-style-type: none"> • Farm insurance programs reducing risk • Regulations increasing risk • Financial incentive conservation programs (cost-share, payments) reducing risk • Reducing risk to maintain a family legacy

Focus Group Findings

The natural resource conservation professionals participating in the focus groups identified several drivers of and constraints to conservation among agricultural producers (Tables 6 and 7). The top conservation drivers were benefits to the farming operation and financial incentives. The top conservation constraints were farm programs and success in farming in the last 20 years.

According to one natural resource conservation professional, farm programs create problems by incentivizing growth and trapping farmers in “their economics.” The participant acknowledged, “... no farmer that I know wants to be a big bad commercial farmer, but they can’t... they just feel like they’re stuck in the rut of their economics, or their mentality [that] they have to keep growing and keep going. And, so I think we just have this huge systemic problem in agriculture.”

One natural resource conservation professional explained how success constrains conservation:

Farmers will always tell you, if we ever made enough money, we’d do conservation. But, the exact opposite of that is the truth. When they’re making money, they forget about conservation. They want more money. So, if they’re making less money, they’re gonna adopt things like this because it saves them money.

Table 6. Drivers of conservation among agricultural producers in the Wild Rice River and Mustinka River watersheds identified by natural resource conservation professionals in focus groups.

Group Priority Ranking	Drivers of conservation
1	Benefits to farming operation (e.g., conservation in low spots/gullies)
2	Getting paid to do it (i.e., incentive payments)
3	Fear of regulations
4	Efficiencies of conservation (e.g., time/fuel savings)
5	Efficiencies of conservation (e.g., best use of land)
6	Peer pressure (e.g., seeing successful operations, having new tractors/trucks)
7	Interest in water quality
8	Interest in wildlife habitat

Table 7. Constraints to conservation among agricultural producers in the Wild Rice River and Mustinka River watersheds identified by natural resource conservation professionals in focus groups.

Group Priority Ranking	Constraints
1	Farm programs (e.g., insurance removes risk, corn- and bean-centered)
2	Success in farming in last 20 yrs (i.e., easy to be farmer)
3	Peer pressure (e.g., no one wants to be first to try, fear of being innovative, coffee shop talk)
4	Absentee landowners and limited knowledge of conservation programs (i.e., removed from area, gets information from renter)
5	Fear of change, risk and losses
6	Who farmers listen to and their promotion tactics (e.g., fertilizer dealers, private industries)
7	Peer pressure and competition (e.g., # bushels)
8	Absentee landowners and limited resources to maintain conservation (e.g., mowing, Conservation Reserve Program)

Participants also outlined what they believe to be key strategies for increasing conservation among farmers:

- Integrating regulatory authority and voluntary compliance/local control (e.g., Conservation Reserve Program letter followed by voluntary county letter).
- Promoting conservation's water quality benefits to local lakes for recreation in rural communities and small towns
- Promoting success stories; encouraging landowner pride; building social identity; peer pressure (e.g., messaging such as "Grant County leads the nation in buffer strips")
- Using testimonials of successful farmers
- Emphasizing benefits to operation and promotional opportunities in marketing

One participant described the importance of group cohesion and community pride: "When you single somebody out sometimes that can backfire against you. If you acknowledge them as a group... group pride and ... then you get the peer pressure working for you. Community pride translates to personal pride many times."

Survey Findings

I. Socio-demographic and Property Characteristics

1. Who are respondents and what are their property ownership characteristics?

Respondents were asked a series of socio-demographic questions and questions about their land or property characteristics.

A vast majority of respondents in the watershed (84%) were male. About one-third of respondents (33%) had attained at least a college degree. Respondents' median age was 63. The vast majority of the respondents were white (95%) and not of Hispanic or Latino descent (99%). Almost two-thirds of respondents (65%) reported an annual household income of less than \$100,000. Respondents reported living 50 years in their community (median) (Appendix Q, Table 2). Almost three-quarters of respondents (73%) reported using their land/property for agricultural production. Almost half of the respondents (47%) depend on their property for half their income or more. Almost half of the respondents (46%) own and manage their land. More than one-third of respondents rent land from another property owner (35%) and 16% of respondents rent land to another individual. Most respondents (56%) make their own decisions about how to manage their land. A vast majority of respondents (87%) reported owning or renting land with a stream or ditch located on or bordering their property (Appendix Q, Table 3). Most respondents own more than 151 acres (65%) (Appendix Q, Table 4).

II. Beliefs about Water Issues

2. What are respondents' beliefs about water quality?

Respondents were asked to rate their familiarity with water resource issues on a four-point scale from not at all familiar (1) to very familiar (4). Respondents were also asked to rate the quality of water in the stream, ditch, lake, or river closest to them and in the Red River on a five-point scale from very poor (1) to very good (5). Most respondents (59%) reported that they were moderately to very familiar with water resource issues (Appendix Q, Table 5). A vast majority of respondents (85%) knew that their property was within the watershed (Appendix Q, Table 6). More than half of respondents (58%) viewed water quality in the stream, ditch, lake, or river closest to them as good to very good (Appendix Q, Table 7), while one-quarter of the respondents (25%) viewed water quality in the Red River as good to very good (Appendix Q, Table 8). About 13% and 16% reported not knowing the quality of the water in the nearest water resource (Appendix Q, Table 7) or in the Red River (Appendix Q, Table 8), respectively.

3. Are respondents concerned about the consequences of water pollution?

The survey inquired about respondents' concerns related to the consequences of excessive water runoff for various uses or purposes. Respondents were asked to rate the extent to which they agreed with the statement "I am concerned about the consequences of excessive water runoff for future generations," as well as the consequences of excessive water runoff for five other object items, on a five-point scale from strongly disagree (-2) to strongly agree (+2). Respondents were also asked to indicate the extent to which they perceive a series of water pollutants/issues and sources of water pollutants/issues as a problem, on a four-point scale from not a problem (1) to severe problem (4). About two-thirds of respondents expressed concern about the consequences of excess water runoff for farmland (67%) and future generations (67%) (Appendix Q, Table 9). The five pollutants/issues in the watershed rated on average as the biggest problems include flooding, soil erosion, sediment, pesticides, and herbicides (Appendix Q, Table 10). As for the sources of pollutants/issues in the watershed, respondents overall rated stream bank erosion, soil erosion from farmland, wind erosion, fertilizer management for crop production, and surface ditch drainage as the biggest problems (Appendix Q, Table 11).

III. Current and Future Conservation Behaviors

4. *Do respondents engage in conservation practices on their property?*

Respondents who use or rent their land for agricultural production (i.e., farmers and farmland owners) were asked the extent to which they are engaged in nine practices. Responses were on a five-point scale from not at all (0) to in all possible locations (4). Three-quarters of farmers/farmland owners reported following a comprehensive nutrient management plan (75%) in at least one location on their farm. A majority of farmland owners also reported protecting wetlands on the farm (80%), using conservation tillage practices (86%) and maintaining buffer/filter strips (79%) in at least one location on their farm. A vast majority of farmland owners (81%) reported they do not use drainage tiles on individual fields. More than half of farmland owners reported that their farm does not have land in conservation cover (51%, Appendix Q, Table 12).

5. *What civic actions have the respondents engaged in the past 12 months related to environmental issues?*

All respondents were asked how often they have engaged in 7 civic actions in the past 12 months on a five-point scale from never (0) to weekly (4). The most commonly reported civic action was volunteerism. One-third of respondents (33%) reported that they have volunteered for community organizations or events every few months in the last 12 months. While almost three-quarters of respondents (72%) have not worked with other community members to protect water resources, a majority of respondents have talked to others at least every few months (61%) about conservation practices. A majority of respondents have never participated in water resource protection initiative (73%), attended a meeting or public hearing about water (56%), or taken a leadership role around water resource conservation in the community (81%) in the past 12 months (Appendix Q, Table 13).

6. *What are respondents' intentions to engage in conservation actions to protect water resources in the future?*

The survey asked all respondents about their intentions to engage in six general conservation actions and seven farmer/farmland owner specific actions in the next 12 months. Respondents were asked to rate the action statements on a five-point scale from most certainly not (-2) to most certainly will (+2). Fewer than half of the respondents (43%) reported that they probably or most certainly will talk to others about conservation practices in the next 12 months. One-third of respondents expressed uncertainty in their intentions to attend a meeting or public hearing about water (33%) or learn more about water resource issues in their watershed (33%). Similarly, more than one-third of respondents (38%) were uncertain whether they intend to work with other community members to protect water resources in the next 12 months (Appendix Q, Table 14).

A majority of farmers/farmland owners reported that they probably or most certainly will use conservation tillage on the farm (61%) and maintain buffer/filter strips along all streams and ditches (52%) in the next 12 months. However, fewer farmers/farmland owners expressed similar intentions to learn more about conservation drainage management practices (41%) or to have land in conservation cover (38%). A majority of farmers/farmland owners (55%) reported that they most certainly or probably will not install tile drainage systems on the farm in the next 12 months (Appendix Q, Table 14).

IV. Perceived constraints and Influences on Conservation Behavior

7. Who influences respondents' conservation practices?

Respondents were asked to indicate the extent to which 20 individuals, groups, and organizations influence their decisions about conservation practices on their land, on a four-point scale from not at all (1) to a lot (4). Overall, respondents rated family as most likely to influence their decisions about conservation practices. Farmers, neighbors, county Soil and Water Conservation District, and local watershed district/watershed management organizations also were highly rated as influential in their decision making (Appendix Q, Table 15). A majority of respondents reported that the county Farm Bureau and farmer's union is not at all influential in their decision making about conservation.

8. Do respondents and their communities have the ability to protect water resources?

Respondents were asked to rate the extent to which they agreed or disagreed with 10 statements about their own ability and their community's ability to protect water resources on a five-point scale from strongly disagree (-2) to strongly agree (+2). Most respondents (78%) agreed that their use of a conservation practice contributes to healthy water resources. About two-thirds of respondents (66%) agreed that they have the knowledge and skills to use conservation practices on their land. However, fewer respondents (25%) agreed that they have the equipment they need to adopt a new conservation practice. Most respondents (59%) agreed that farmers in their community have the ability to work together to change land use practices. Fewer than half of respondents (39%) agreed that they have the financial resources they need to use conservation practices. Similarly, about one-quarter of respondents agreed that their community has the financial resources (24%) and leadership (28%) it needs to protect water resources (Appendix Q, Table 16).

9. What would increase the likelihood that respondents would maintain conservation practices?

Respondents were asked to indicate the likelihood that a series of conditions or actions would influence their adoption or continued use of conservation practices on a five-point scale from very unlikely (-2) to very likely (+2). A majority of respondents reported that they would be more likely to adopt or continue to use conservation practices on their land/property if conservation program requirements were less complex (59%), if they had access to cost-share resources (63%), or if they could get higher payments for adopting conservation practices (59%). Regulations that mandated using a conservation practice and enrolling in a registry program that recognizes local conservation stewards were on average the lowest rated factors (Appendix Q, Table 17).

V. Attitudes toward Water Resource Management

10. What are respondents' attitudes toward management actions to protect the quality of water in Minnesota?

Respondents were asked to indicate the extent to which they support or oppose eight potential water resource management actions on a five-point scale from strongly oppose (-2) to strongly support (+2). The majority of respondents expressed at least some support for five out of the eight management actions listed. Overall, more respondents expressed support for actions such as streamlining existing programs that offer financial incentives to property owners/farmers for conservation (67%), expanding programs that offer financial incentives to property owners/farmers for conservation practices (66%),

and promoting voluntary adoption of conservation practices through education and outreach (65%) than any other action listed. Overall, more respondents expressed opposition for actions such as increasing land use laws and regulations (52%) and enforcing existing land use laws and regulations (23%) than any other action listed. At least one-third of respondents were neutral (i.e., neither support nor oppose) about management actions such as conducting more water research and monitoring (33%), engaging more citizens in local land use and water resource decision making (39%), and coordinating land use and water planning and management across communities at a watershed scale (38%) (Appendix Q, Table 18).

VI. Respondent Subgroup Comparisons

11. How do respondents in Wild Rice and Middle Snake Tamarac Rivers watersheds vary in their water resource perspectives?

There were no significant differences between respondents in Middle Snake Tamarac Rivers Watershed District (MST) and Wild Rice River Watershed District (WR) in their socio-demographic and property characteristics, except in gender. Female respondents are better represented in MST (23%) than in WR (12%) (Appendix Q, Table 21). Some notable differences were identified in perceived ability and motivators of conservation. Respondents in MST disagreed to a greater extent than WR respondents that their community has the financial resources needed to protect water resources. MST respondents were more likely than WR respondents to adopt or continue to use conservation practices if they could get higher payments for adopting conservation practices (Appendix Q, Table 22).

MST respondents reported being influenced to a greater extent by 8 out of the 20 individuals/groups listed than did WR respondents. These groups include MN Department of Agriculture, Farm Service Agency, local MN extension agent, certified crop advisors, seed/input dealer, farmer's union, local co-op, and agronomist/agricultural advisor (Appendix Q, Table 23). These subgroups also varied in their current use of practices. WR respondents reported that they maintain a buffer/filter strip along streams and ditches and protect wetlands in more locations than did MST respondents. They were also more likely to use drainage tiles in more locations (Appendix Q, Table 24).

12. How do respondents who own small and large properties vary in their water resource perspectives?

There were no significant differences between small (fewer than 300 acres) and large (300 acres or more) landowners in socio-demographic characteristics. There was a significant difference between small and large landowners in the use of their land for agricultural production. A greater proportion of large landowners (58%) use their land for agricultural production than small landowners (42%) (Appendix Q, Table 26).

Some key differences were identified between small and large landowners. Large landowners overall agreed to a greater extent than small landowners that they have the knowledge and skills needed to use conservation practices on their land. However, they agreed to a lesser extent than small landowners that farmers in their community have the ability to work together to change land use practices. Small landowners disagreed to a greater extent than large landowners that they have the equipment needed to adopt a new conservation practice (Appendix Q, Table 27).

Small and large landowners also differed in 7 out of 20 conditions or actions that would influence their adoption or continued use of conservation practices. While learning about wildlife benefits was more likely to influence small landowners, higher payments for conservation practice adoption, evidence that

conservation practices did not reduce crop yield, and compensation for lost crop production were more likely to influence large landowners' adoption of conservation practices. Further, large landowners were also more likely than small landowners to adopt or continue to use conservation practices if conservation programs were more flexible and less complex. Regulations that mandate using a conservation practice were more likely to influence small landowners than large landowners (Table 27). Large landowners also differed from small landowners in terms of individuals or groups that influence their conservation decisions. Large landowners were influenced to a greater extent than small landowners by farmers, neighbors, financial institutions, farm service agency, certified crop advisors, and their agronomists/agricultural advisors (Appendix Q, Table 28).

Large landowners differed from small landowners in their adoption of three out of nine practices listed. Large landowners reported that they use conservation tillage and follow a comprehensive nutrient management plan to a greater extent than did small landowners. They also reported using drain tiles to a greater extent than did small landowners (Appendix Q, Table 29). Significant differences were also found between small and large landowners in their civic engagement. Large landowners reported that they have volunteered for community organizations and events, attended a meeting or public hearing about water, and taken a leadership role around water resource conservation more often in the last 12 months than did small landowners (Appendix Q, Table 30).

13. How do respondents with varying levels of percent agricultural income (i.e., low vs. high) differ in their water resource perspectives?

There were no significant differences between respondents with low percent agricultural income (LPA) (less than 50% of income dependent on agricultural production) and high percent agricultural income (HPA) (50% or more income dependent on agricultural production) in socio-demographic characteristics with the exception of education. A greater proportion of LPA respondents had some college or graduate work (76%) or a graduate degree (76%) than did HPA respondents (24%) (Appendix Q, Table 32).

HPA and LPA respondents also differed in two property characteristics: use of land for agricultural production and property size. A greater proportion of HPA respondents (58%) than LPA respondents (42%) use their land for agricultural production (Appendix Q, Table 33). On average, HPA respondents (Mean = 750 acres) also own more land/property than LPA respondents (Mean = 237 acres) (Appendix Q, Table 34).

Some notable differences were identified in HPA and LPA respondents' perceived ability to use conservation practices. While HPA respondents agreed to a greater extent than LPA respondents that they have the knowledge and skills they need to use conservation practices, LPA respondents agreed to a greater extent that they have the equipment needed to adopt a new conservation practice. Differences between LPA and HPA respondents in the motivators of conservation were also identified. While learning about the wildlife benefits of conservation practices were more likely to influence LPA respondents' decisions to use conservation practices, HPA respondents were more likely to be influenced by compensation for lost crop production. Further, HPA respondents were more likely to adopt or continue to use conservation practices if conservation program requirements were less complex (Appendix Q, Table 35).

There were also significant differences between LPA and HPA respondents in the extent to which their conservation decisions are influenced by 7 of the 20 individuals or groups listed. HPA respondents were influenced to a greater extent than LPA respondents by farmers, financial institutions, farm service

agency, agricultural commodity associations, certified crop advisors, seed/input dealer, and their agronomists/agricultural advisors (Appendix Q, Table 36).

LPA and HPA respondents also differed in their use of two out of nine practices listed. HPA respondents have drainage water management plans and follow comprehensive nutrient management plans to a greater extent than did LPA respondents (Appendix Q, Table 37). Similarly, HPA respondents reported being more civically engaged than did LPA respondents. HPA respondents were engaged more often than LPA respondents in four out of seven civic actions listed (e.g., working with other community members to protect water resources, attending a meeting or public hearing about water) (Appendix Q, Table 38).

DISCUSSION AND RECOMMENDATIONS

Conclusions

The following conclusions are based on a synthesis of survey, interview, and focus group findings. Further strategies for interventions also are provided (Table 8).

I. Conservation decision making is a community-based process.

According to the survey findings, the biggest social influencers on landowner conservation decision making are family, farmers, neighbors, county SWCDs, and local watershed districts. Downstream property owners, larger property owners, and those with higher percent of agricultural income are influenced to a greater extent in conservation decisions by multiple types of agricultural professionals than upstream, smaller, and lower percent agricultural income property owners. Farmers interviewed also revealed that they depend a significant amount on the guidance of agricultural professionals and corporate representatives including agricultural advisors, seed and fertilizer dealers, and the MN Department of Agriculture. Thus, conservation programming should continue to bring these individuals and organizations into the fold. Promoting informal and formal exchange and interaction among and between these stakeholders and using consistent messaging will be important intervention strategies.

II. Multiple capital and capacity constraints to conservation action exist.

The biggest constraints to water resource conservation appear to be equipment, community financial resources, community leadership, and personal financial resources. However, perceived constraints vary by location in the watershed, property size, and percent agricultural income. For example, knowledge, skills are a bigger constraint for small landowners and those with a lower percent agricultural income, while equipment is a bigger constraint for small landowners and those with a higher percent ag income. Community financial resources are a bigger constraint for landowners downstream (MST). Farmer cooperation is a bigger constraint for larger landowners. Support is needed in making equipment available either through annual rental agreements or free or reduced rate trial periods. Leadership development programs, technical assistance and training, and forums that bring larger landowners together appear to be worthy investments.

III. Conservation program reformation, increased financial incentives, and soil conservation are primary drivers of conservation action.

The biggest drivers of water resource conservation appear to be reducing the complexity and increasing consistency of conservation programs, access to cost-share resources, higher payments for adoption, evidence that conservation practices improve water resources, and compensation for lost crop production because of conservation practices. Again, survey respondent motivators varied by location, property size, and percent agricultural income. Higher payments were a bigger motivator for downstream (MST) landowners and larger landowners. Increased program flexibility and reduced program requirement complexity was a bigger motivator for larger landowners. Other finance related motivators for larger landowners were compensation for lost crop production because of conservation practices and evidence that conservation practices did not reduce yield. For smaller landowners and lower percent agricultural income landowners, learning more about the wildlife benefits of conservation practices was a bigger motivator. Like larger landowners, higher percent agricultural income landowners were motivated more by compensation for lost crop production and reducing complexity of program requirements.

IV. Beliefs, social influences, and conservation action varies by watershed location, land ownership size, and percent agricultural income.

Upstream and downstream landowners vary in perceived constraints, motivators, social influences, and conservation practices. Survey and interview analysis suggests that upstream and downstream landowners and farmers have somewhat different perspectives and worldviews on water resource conservation. Financial resources appear to be more of a constraint to downstream landowners than upstream landowners, and thus, more of an incentive for conservation practices. Downstream landowners also are influenced by agricultural professionals including MN Department of Agriculture and agricultural advisors to a greater extent than upstream landowners. Upstream landowners have adopted buffer strips and protected wetlands to a greater extent than downstream landowners, but they also use drainage tiles to a greater extent. Interview findings reveal some level of conflict between upstream and downstream landowners in beliefs about who should pay and who should benefit from conservation. Issues of social justice and concerns about fairness were commonplace; especially with respect to asking upstream landowners to retain water so downstream landowners have reduced flooding.

Smaller and larger landowners and landowners with higher and lower proportions of agricultural income differ in perceived constraints, motivators, social influences, conservation practices, and civic engagement. Statistical analysis of the survey data revealed larger landowners and landowners with higher proportions of agricultural income had corresponding differences when compared to their counter parts (i.e., smaller and lower proportion of agricultural income landowners, Figure 1). Though the groups did not vary sociodemographically (except higher/lower proportion of agricultural income), they varied significantly in their beliefs social influences and conservation actions.

Table 8. Integrated findings, example intervention strategies, and targeted audiences

Finding	Example intervention strategy	Targeted audiences
Equipment is a constraint.	Lease conservation equipment annually or for a reduced or free trial period.	All; Smaller landowners; higher percent ag income
Knowledge and skills are a constraint; increasing education and outreach had strong support.	Provide training and technical assistance tailored to the knowledge and skills of the audience. Smaller landowners and lower percent ag income landowners may be most receptive to these programs. Promote soil conservation and wildlife benefits.	Smaller landowners; lower percent ag income
Community capacity and capital are constraints.	Build community capacity, especially conservation leadership in the community and farmer cooperation. Support communities with funding to build conservation capital.	All; large landowners; downstream landowners
The survey findings suggest that financial resources are less of a constraint than they are a motivator; expanding financial incentive programs had moderate support. Many interviewees characterized the costs of taking land out of production or reducing yield as a constraint and were supportive of financial incentive programs.	Use financial incentive programs cautiously. Cost-share programs may have more success than payment or compensation programs.	All; downstream landowners; larger landowners; higher percent ag income
Reducing the complexity of program requirements was the biggest motivator overall and streamlining financial incentive programs had moderate support among survey respondents. Interviewees emphasized the need for consistency in programs over time.	Streamline programs and simplify requirements. Provide more flexibility and consistency in programs over time.	All; larger landowners; higher percent ag income
Evidence that conservation practices improve water resources is a big motivator for survey respondents. Several interview participants described the need to maintain yield as a bigger priority.	Feature field scale or local level success stories. Sponsor demonstration sites and field days. Support farmer-to-farmer testimonials and knowledge networks.	All
Regulations were not a big motivator; increasing regulations had strong opposition among survey respondents. A few interview participants acknowledged the need for regulations or conservation program requirements to maintain natural resources.	Engage diverse landowners and community leaders in policy dialogue and carefully assess the economic, ecological, social, cultural, and psychological impacts of policy/regulatory change.	All; larger landowners

Finding	Example intervention strategy	Targeted audiences
Learning more about the wildlife benefits of conservation practices is a big motivator.	Emphasize wildlife benefits in education and outreach programs.	Small landowners; lower percent ag income
Learning more about soil conservation and erosion control are big motivators for both survey respondents and interview participants.	Emphasize soil benefits in education and outreach programs.	All
Landowners are not very familiar with water resource issues in their watershed and very few survey respondents perceive water quality problems in the water body nearest to their property. Flooding, erosion, and sediment are believed to be the biggest problems in the watersheds. Fertilizer management is seen as a slight problem among survey respondents. Several interviewees expressed concern about the use of chemicals. More than half of landowners surveyed have not heard about a water resource protection initiative in the last 12 months. Increasing education and outreach had strong support.	Develop, tailor, and localize education and outreach programs about water resource concerns, problems, and solutions. Programs focused on flooding, erosion control, and sediment reduction may have the most appeal.	All
Concern, conservation practice, civic action gap: Most landowners are concerned about the consequences of excess water runoff for farmland, future generations, community members, aquatic life, and wildlife. And, the majority of agricultural landowners are using conservation practices on their farms and talking about conservation practices with others. However, a small minority of landowners are getting involved civically in water resource protection by participating in or leading a water resource conservation initiative.	Promote civic engagement among landowners through leadership development training, facilitating leadership opportunities, and providing incentives for conservation leadership (e.g., payment, cost-share, compensation for time). Important differences exist between leadership in formal (e.g., watershed groups) and informal (e.g., coffee klatches) networks exist, but both are important	All; small landowners
Conservation decision making is a community-based, collective process. Landowners surveyed were most influenced by family, farmers, neighbors, and local resource conservation staff. Many interviewees highlighted the influence of ag corporations and input dealers on farmer decision making.	Build capacity among community members of influence, local resource conservation staff, and input dealers in conservation knowledge and leadership. Support local knowledge networks and knowledge exchange throughout the community.	All

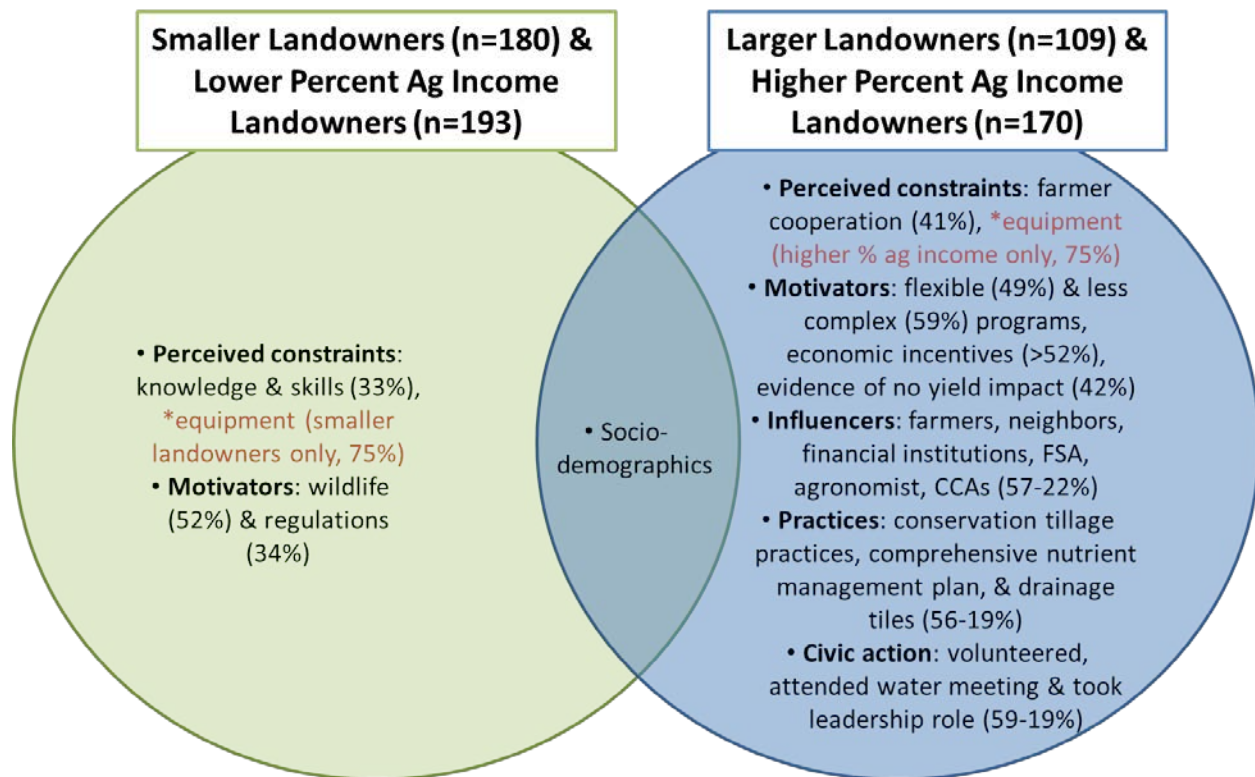


Figure 1. Comparisons between land ownership size and percent agricultural income (*equipment was a bigger constraint for smaller landowners and higher percent agricultural income landowners when compared to their counterparts).

Note: (%) refers to the percent of the total sample who reported these beliefs and actions.

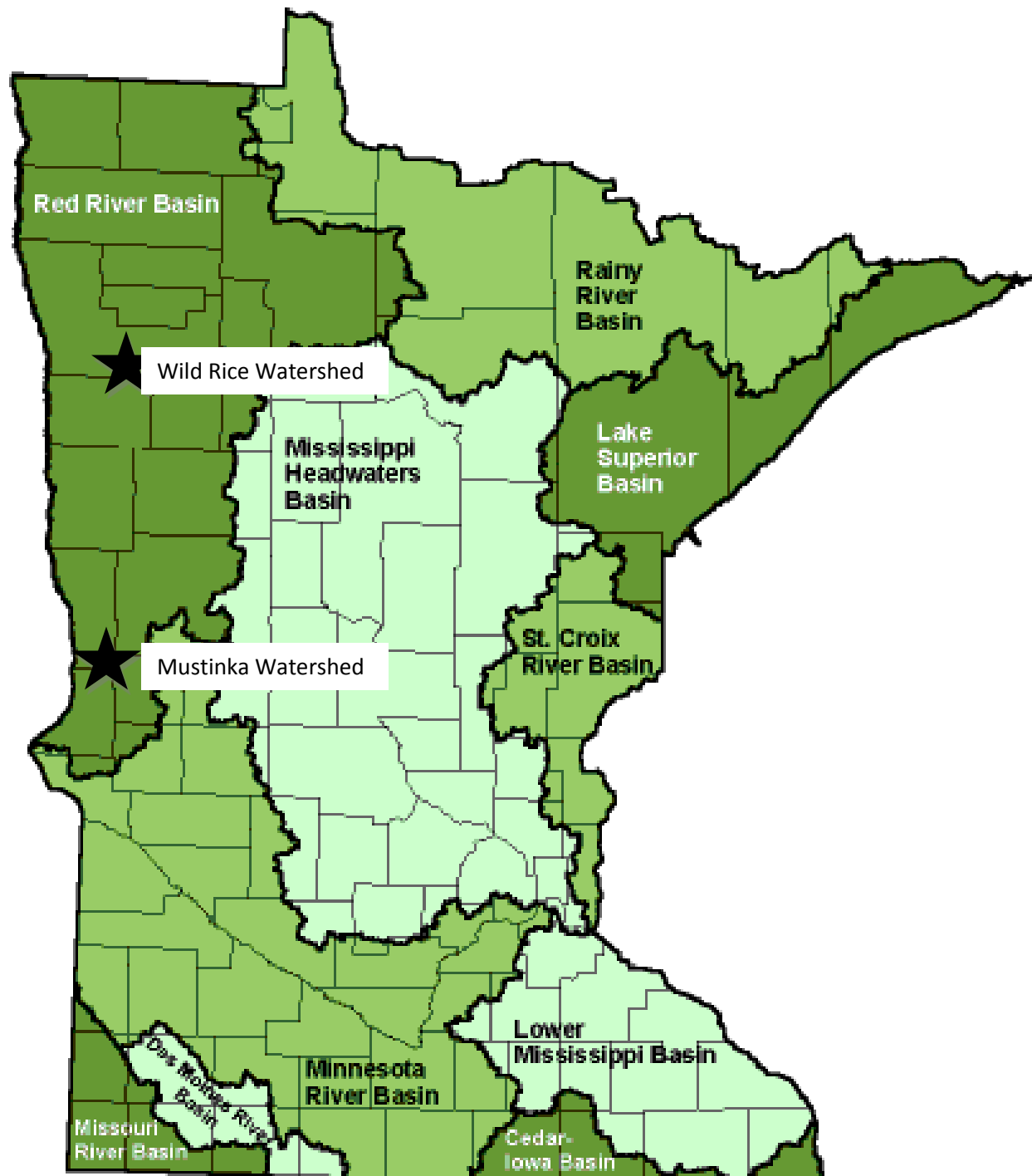
REFERENCES

- Dillman, D. A., Smyth, J. D., & Christian, L. M. (2009). *Internet, mail, and mixed-mode surveys: the tailored design method*. Wiley & Sons.
- Dollinger, D., Lundeen, B., Stroom, K., Streitz, A., Monson, B., Nelson, S., . . . Richter, D. (2013). *Mustinka river watershed monitoring and assessment report*. (No. wq-ws3-09020102b). Saint Paul, MN: Minnesota Pollution Control Agency.
- Harland, P., Staats, H., & Wilke, H. A. M. (2007). Situational and personality factors as direct or personal norm mediated predictors of pro-environmental behavior: Questions derived from norm-activation theory. *Basic and Applied Social Psychology*, 29(4), 323–334.
- Matsumoto, D., Weissman, M. D., Preston, K., Brown, B. R., & Kupperbusch, C. (1997). Context-specific measurement of individualism-collectivism on the individual level. *Journal of Cross-Cultural Psychology*, 28(6), 743–767.
- Minnesota Pollution Control Agency. (2011, November 28). *Wild rice river watershed - watershed at a glance*. Retrieved from <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/watersheds/wild-rice-river.html>
- Minnesota Pollution Control Agency. (2012, February 09). *Mustinka river watershed - watershed at a glance*. Retrieved from <http://www.pca.state.mn.us/index.php/water/water-types-and-programs/watersheds/mustinka-river.html>
- NVivo qualitative data analysis software; QSR International Pty Ltd. Version 10, 2012.
- Prokopy, L., Genskow, K., Asher, J., Baumgart-Getz, A., Bonnell, J., Broussard, S., ... others. (2009). Designing a regional system of social indicators to evaluate nonpoint source water projects. *Journal of Extension*, 47(2), 8.
- Red River Watershed Management Board. (n.d.). *Wild rice watershed district*. Retrieved from <http://www.rrwmb.org/html/watersheds.cfm?ID=8>
- Schultz, P. W. (2001). The structure of environmental concern: Concern for self, other people, and the biosphere. *Journal of Environmental Psychology*, 21(4), 327–339.
- Schwartz, S. H. (1977). Normative Influences on Altruism¹. *Advances in Experimental Social Psychology*, 10, 221–279.
- Stern, P. C., Dietz, T., & Guagnano, G. A. (1998). A brief inventory of values. *Educational and Psychological Measurement*, 58(6), 984–1001.
- Stern, P. C., Dietz, T., & Kalof, L. (1993). Value orientations, gender, and environmental concern. *Environment and Behavior*, 25(5), 322–348.

APPENDIX A: RED RIVER BASIN

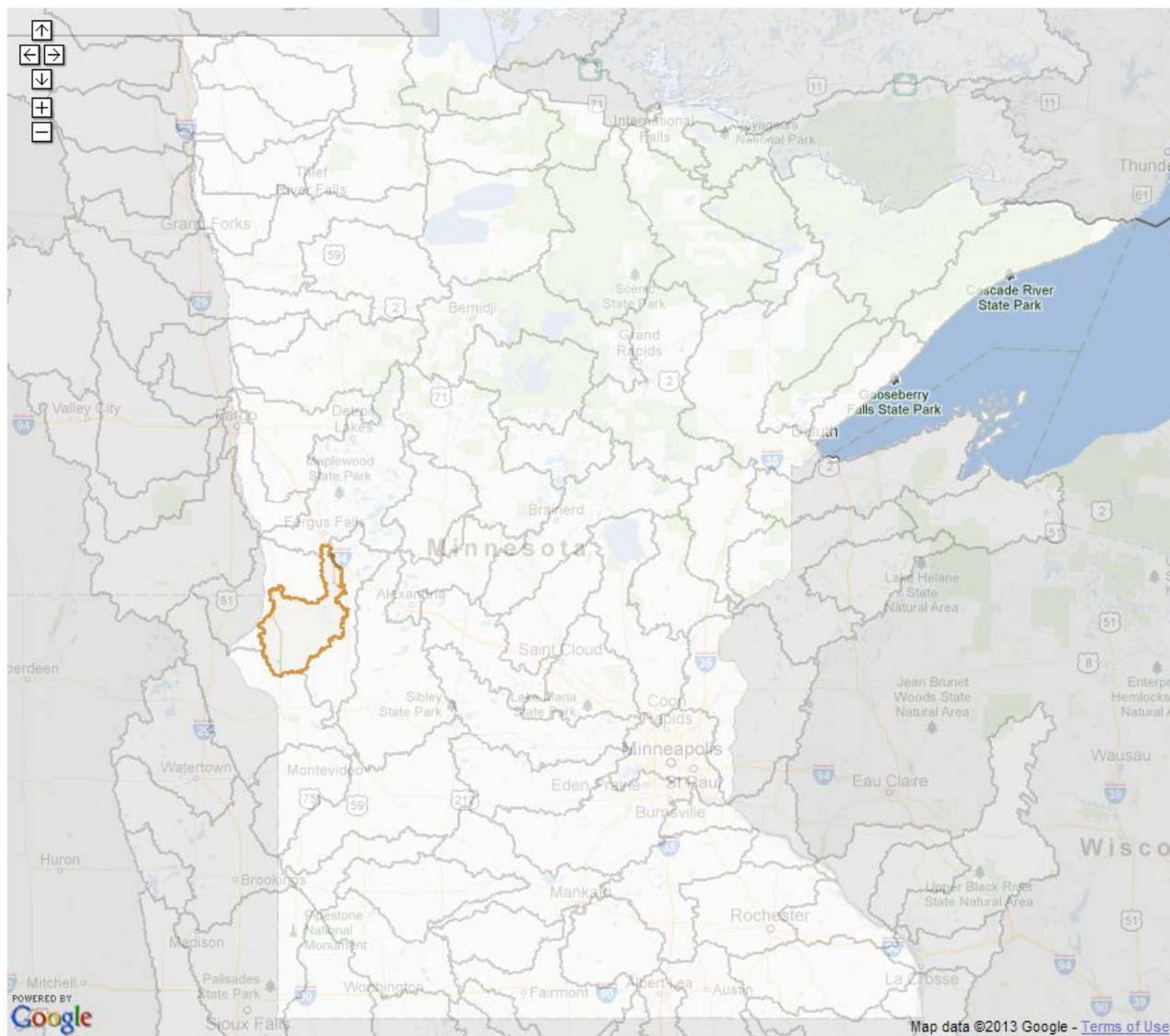
Minnesota River Basins

produced by Minnesota Planning



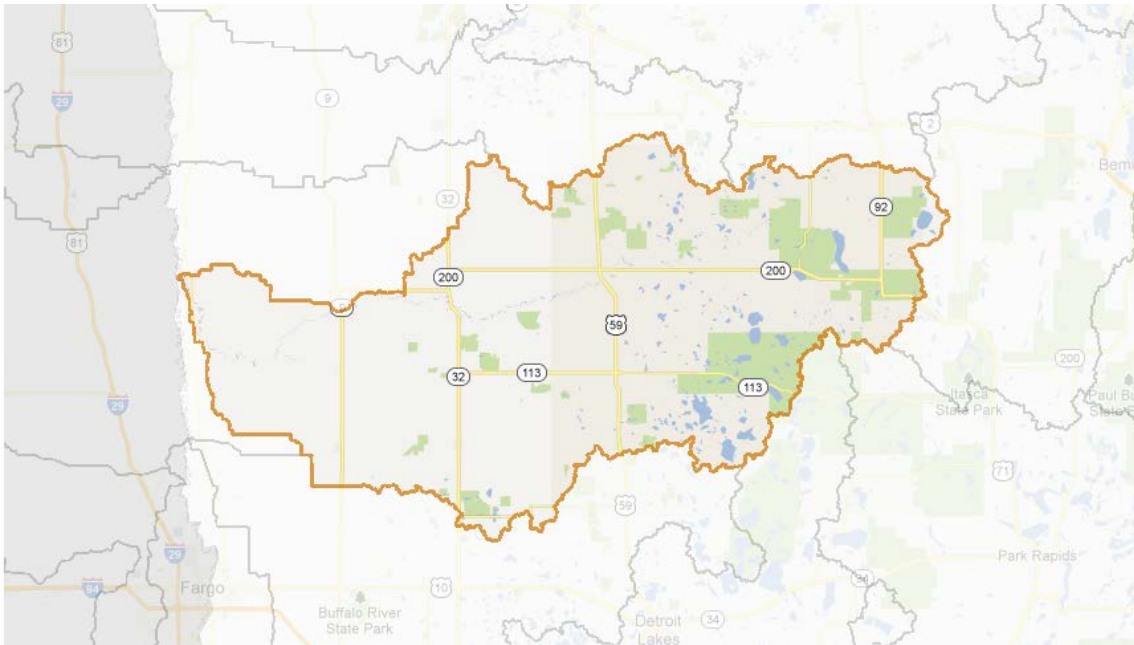
Minnesota River Basins (Anfinson & Gibbon, 2008)

APPENDIX B: MUSTINKA RIVER WATERSHED MAP

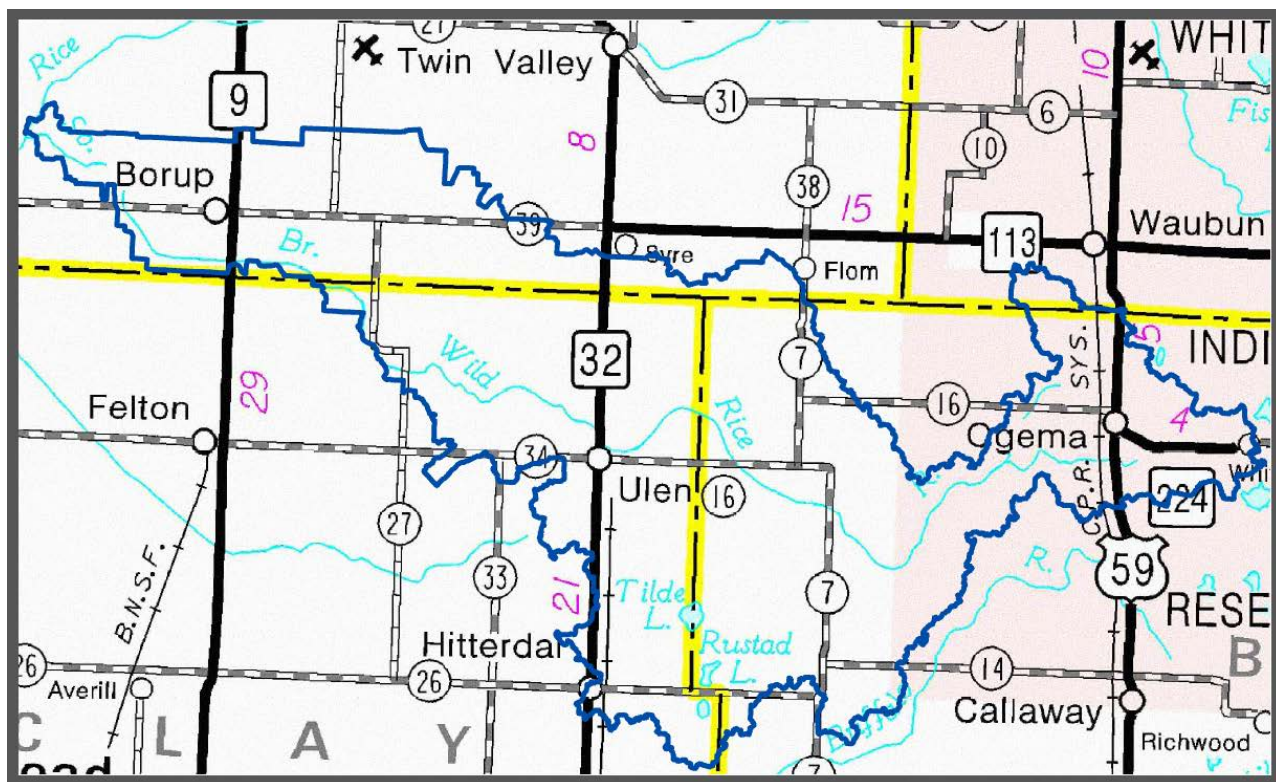


Mustinka River watershed (Minnesota Pollution Control Agency, 2012)

APPENDIX C: WILD RICE RIVER WATERSHED (SOUTH BRANCH) MAP



Wild Rice Watershed District (Minnesota Pollution Control Agency, 2011)



South Branch of the Wild Rice River

APPENDIX D: NETWORKING SCRIPT

Red River Basin Agricultural Conservation Practices Study, Script for Network Contact

“Hello, my name is _____. I am a graduate student working on a research project with the Northwest Regional Sustainable Development Partnership and the University of Minnesota in consultation with local representatives from BWSR and NRCS. We are conducting a study of agricultural conservation practices in the Red River Basin from the perspectives of local farmers. Over the next several weeks, we will be interviewing farmers in the Mustinka watershed about their farms and what influences their decisions about conservation practices. We plan on contacting farmers with varying backgrounds and different attitudes toward conservation practices. We will also be interviewing farmers in the South Branch of the Wild Rice River. The reason I’m calling you is that first, we wanted to let you know about our study and to find out what questions you might have. Second, we would like your input. I was wondering if you could recommend any farmers in the Mustinka watershed who might be willing to share their perspectives with us on agricultural conservation practices. As I mentioned, we are looking for folks with a range of opinions.”

If yes: “Terrific. Thanks so much.”

- a. Write down contact information of farmers. Can we mention that you recommended them?
- b. “Do you know of any more contacts that might be able to recommend additional farmers for interviews?”

If no: “Ok, do you know of anyone who might be able to recommend farmers for interviews? (Write down contact information) Thank you for your time. Good bye.”

If they seem unsure: “We have designed the project in collaboration with local representatives from BWSR, NRCS, MN Department of Agriculture, and MN DNR and we have their support. Farmer participation is voluntary and confidential. We want to document how farmers feel about conservation practices so that we can support future development of programs that make sense to farmers and benefit water resource management in the Red River Basin.”

If they want to know how the information will be used: “A final technical report will be written that documents the study process, presents the interview results, and provides recommendations for water resource professionals. If you are interested in the report, we can make sure we get you a copy. We will also be presenting our interview findings in a series of focus groups with resource professionals in the area. Would you be interested in participating in something like this in the future?”

If they want to know who is supervising the research: “Mae Davenport is the supervisor for this study. She is an associate professor in the Department of Forest Resources at the U of M. If you would like to contact her directly I can give you her phone number [612-624-2721] or email address [mdaven@umn.edu].”

If they ask about IRB: The research project has been approved by the IRB/Human Subjects Committee.

APPENDIX E: INITIAL CONTACT SCRIPT

Red River Basin Agricultural Conservation Assessment

Script for Initial Contact

"Hello, my name is _____. I am a graduate student conducting research on watershed management for Mae Davenport, Assistant Professor in the Department of Forest Resources at the University of Minnesota. This study involves farmers in the [Mustinka, Wild Rice, Middle-Snake-Tamarac] Watershed. This research will provide decision-making support specific to farmers and their fields that aids in promoting agricultural conservation practices in an effective and economical way. I have been interviewing farmers to gather their insights about their operations regarding conservation and was hoping you would be able to assist me by participating in the study and sharing your perspectives with me. We are offering an optional \$XX gift for your participation. The interview takes about one hour. Would you be willing to participate?"

If yes: "Thank you. I am available on _____ (days of week, times, have alternates ready) is there a time that would work best for you? [Set date, time, location (get directions)]. I would like to send you a confirmation email with date, time and location information. The email will include all of my contact information, in case you have any questions or concerns. Do you have an email address I can send the confirmation to?"

- c. **If yes,** take it down or confirm we have the correct email address for them. "Thank you. I look forward to meeting with you on ____ (agreed upon date) ____."
- d. **If no,** "Is ____ (phone # you contact them with) ____ the best way for me to get a hold of you? In case you need to get a hold of me with questions or concerns, my phone number is ____." I look forward to meeting with you on ____ (agreed upon date) ____.

If no: "Ok, thank you for your time. Good bye."

If they seem unsure: "Just to be clear, participation is completely voluntary and if you decide to participate you can withdraw at any time. Your identity will remain confidential and we won't include any information that would make it possible to identify you in the final report. We're only talking to a limited number of key representatives, so capturing your perspective is important. Can I ask what your concerns about participating are?" [Try to address their concerns]

If they want to know why they are being asked to participate: "We're interviewing a variety of community members to try to get diverse perspectives and a range of experiences. I've been conducting background research and see that you are a [position in organization] **OR** [Name of person] recommended I contact you. Since we are only able to conduct a limited number of interviews, capturing your perspective is important."

If they want to know how the information will be used: "We are trying to understand the opportunities and constraints to improving watershed management in the community. We'll be putting together a final report that identifies those opportunities and constraints to share with community leaders,

educators and water resource professionals. Your information will be kept confidential and there will not be any identifying information in the report.”

If they want to know what the study is for: “This project is aimed at understanding the critical capacities communities need to sustainably manage their watersheds. We’re collecting social data to assess the needs and opportunities in your community and identify strategies that could be used to sustainably management the watershed. This will lead to an improved understanding of the drivers and constraints to sustainable watershed planning and management at the landowner, community and watershed levels.”

If they want to know who is supervising the research: “Mae Davenport is the supervisor for this study. She is an assistant professor in the Department of Forest Resources at the U of M. If you would like to contact her directly I can give you her phone number [612-624-2721] or email address [mdaven@umn.edu].”

If they ask about IRB: The research project has been approved by the IRB/Human Subjects Committee.

APPENDIX F: CONSENT FORM

RRB Agricultural Conservation Practice Study Consent Form

You are invited to participate in a study of agricultural conservation practices in the Red River Basin from the perspectives of local farmers. You were selected as a possible participant for an interview because you are a farmer in the Mustinka River or Wild Rice River watersheds. We ask that you read this form and ask any questions you may have before agreeing to be in the study. This study is being conducted by: Mae Davenport, Assistant Professor at Department of Forest Resources, University of Minnesota.

Background Information

The purpose of this study is to better understand what influences farmers' decisions about conservation practices.

Procedures:

If you agree to be in this study, we would ask you to participate in an interview lasting approximately 90 minutes. The interview will be audio-recorded and transcribed.

Risks and Benefits of being in the Study

Risks associated with this study are minimal; responses are confidential and participants' names will not be linked to any information in any publications. Benefits of participation include increased awareness of agricultural conservation practices. Study results will be made available to the public and all participants will have access to them.

Compensation:

A gift or cash, valued at \$50, will be offered for participation in an interview.

Confidentiality:

The records of this study will be kept private. In any sort of report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely and only researchers will have access to the records. Your responses to the interview questions will be audio-recorded, transcribed and kept for three years in a locked office. Afterward, these recordings will be destroyed. Only those directly involved with the project will have access to the audio recording or the interview notes.

Voluntary Nature of the Study:

Participation in this study is voluntary. Your decision whether or not to participate will not affect your current or future relations with the University of Minnesota. If you decide to participate, you are free to not answer any question or withdraw at any time without affecting those relationships.

Contacts and Questions:

The researcher conducting this study is: Mae Davenport. You may ask any questions you have now. If you have questions later, **you are encouraged** to contact her at address: 115 Green Hall 1530 Cleveland Ave. North, St. Paul, MN 55108-6112, phone: 612-624-2721, email: mdaven@umn.edu.

If you have any questions or concerns regarding this study and would like to talk to someone other than the researcher, **you are encouraged** to contact the Research Subjects' Advocate Line, D528 Mayo, 420 Delaware St. Southeast, Minneapolis, Minnesota 55455; (612) 625-1650.

You will be given a copy of this information to keep for your records.

Statement of Consent:

I have read the above information. I have asked questions and have received answers. I consent to participate in the study.

"I agree_____ I disagree_____ to have my responses audio-recorded"

"I agree_____ I disagree_____ that Mae Davenport may quote me anonymously in her papers"

Signature:_____ Date: _____

Signature of Investigator:_____ Date: _____

APPENDIX G: STUDY INTERVIEW GUIDE

Interview guide, University of Minnesota

First, I'd like to start with a few questions about your farm and farming in general.

1. Tell me about your farm and what it means to you. a. How would you describe your farm to a friend?
2. What do you like about being a farmer?
3. What worries or concerns you the most about farming today?
4. If you could change anything about farming today, what would you change?

Next, I would like you to learn more about your decision making process on your farm.

5. First, could you please describe for me the ownership and management arrangement of your farm?
a. Do you rent farmland through a crop-share lease or cash rental?
6. What are the most important considerations for you when making decisions about your farm?
7. Do you consult with others when making those decisions? a. If so, who do you talk to?
8. How do you evaluate the success of your farm operation? a. What kinds of outcomes are you looking for in judging success?
9. What issues challenge or limit you in making your farm operation a greater success?
10. Have you changed the way you farm in the past 5 years in attempt to make your farm more successful?

As you may know, there is increasing concern about flooding and water quality in the Red River Basin. In turn, resource professionals are promoting conservation practices throughout the basin to address these problems. Farmers, in particular, have been encouraged to consider agricultural conservation practices to reduce the impacts farming has on water resources. I have a few questions for you about water resources in the area.

11. Are you concerned about water resource problems in the Red River Basin? Please explain.
12. Are you concerned about water resource problems in the Mustinka River watershed? Please explain.
a. [If yes] What consequences of water resource problems concern you the most?
13. Are you concerned about water-related impacts to your farm, such as erosion?

14. Who do you think should be responsible for solving water resource problems in the Mustinka River watershed? a. What role should farmers play in water resource protection?

The next set of questions inquires about your experiences with and opinions about agricultural conservation practices.

15. First, a broad question: What does the term “conservation” mean to you? a. What do you see as your role in conservation?

16. Do you use practices on your farm that reduce the impacts your farm has on water resources? Please describe those practices for me. *[Write down/check off practices on checklist, then for each practice ask the following]* a. How long have you used this practice on your farm?

b. What first motivated you to use this practice?

c. What do you like about this practice?

d. What don't you like about this practice?

e. Is this practice doing what it was intended to do? Please explain.

f. On a scale of 1-5, one being “not at all likely” and five being “extremely likely” how likely are you to maintain this practice in the future? Please explain.

17. Do you budget for implementing conservation practices each year?

18. I have a list of conservation practices that resource professionals have recommended to farmers in this area. You've described some of these practices already. I'd like to get your perspectives on the other practices on this list. *[Ask for all remaining practices in checklist, those not described in 15]* a. Before we focus on that list, are there other practices you have been considering? *[if so, ask questions b-e for each, if not go through list and ask b-e for each]*

b. What have you heard about this practice?

c. What has influenced your decision not to use this practice?

d. On a scale of 1-5, one being “not at all likely” and five being “extremely likely” how likely are you to adopt this practice in the future? Please explain.

e. Would you adopt this practice if things were different? Please explain.

19. Overall, what are the most important considerations for you when making decisions about conservation practices on your farm?

20. Would you be more likely to adopt or maintain conservation practices if... a. You knew they had benefits downstream? i. Which benefits would be most important to you? (e.g., reduced flooding, increased water quality, enhanced wildlife habitat)

b. You had financial assistance to implement the practices?

c. You had evidence that the practices would not reduce yield?

d. Most farmers you knew had adopted the practices?

e. You could talk to other farmers about how to make the practices work on your farm?

21. Do you talk to others about conservation practices? Who do you talk to?

22. Who do you consider to be the most trusted source of information about conservation practices?

Finally, I have a few more general questions for you about water resource conservation in the RRB.

23. In five years do you think you will have conservation practices on your land? Please explain.

24. What do you think are the 3 biggest obstacles in the way of healthy water resources in the Red River Basin?

25. Is there anything you would like to add about your farm, conservation practices or water resources in general that we haven't covered?

APPENDIX H: BACKGROUND INFORMATION SHEET

ID# _____

Please do not put your name on this worksheet.

To better document the types and range of farmers we talk to, we are asking participants to complete a short background information worksheet. This information will only be presented as a summary of study participant characteristics. All efforts will be made to maintain confidentiality and any information provided that may reveal your identity will be excluded from published documents. Your name will not be associated with the data collected and will not be referenced in any future publications.

1. How many years have you lived in your community? _____.
2. How many years have you been farming? _____.
3. Approximately, how long has your farm been in your family? _____.
4. What type of crops do you grow? And, approximately what percent of your total crops is made up of each crop type?

Crop type	% of total crops
Total	100%

5. What crop rotation are you currently using?
6. How far is the distance from your home to your farmland (in miles)? _____.
7. Which of the following best describes the ownership arrangement of the land you farm?
 - a. I own and manage my own farmland.
 - b. I rent my farmland to another party.
 - c. I rent farmland from another party.
 - d. I own and manage my own farmland and rent farmland *to* another party.
 - e. I own and manage my own farmland and rent farmland *from* another party.

- f. Other (please specify): _____.
8. Approximately how many acres is your land/property? _____
9. Are you involved in any farming-related organization/associations in your community (e.g., MN Corn Growers Association, MN Farmers Union, etc.)? Please specify:
- _____
- _____
10. What is your gender? Male Female
11. In what year were you born? _____.
12. What is the highest level of formal education you have completed?
- | | |
|--|------------------------------|
| a. Did not finish high school | e. College bachelor's degree |
| b. Completed high school | f. Some graduate work |
| c. Some college but no degree | g. Completed graduate degree |
| d. Associate degree or vocational degree | (Masters or PhD) |
13. What percent of your income is dependent on your land?
- | |
|------------------|
| a. 0% |
| b. 1-25% |
| c. 26-50% |
| d. More than 50% |
14. Which category best describes your **total household income from all sources** in 2010 before taxes?
- | | |
|----------------------|------------------------|
| a. Under \$10,000 | g. \$100,000-\$149,999 |
| b. \$10,000-\$24,999 | h. \$150,000 or more |
| c. \$25,000-\$34,999 | |
| d. \$35,000-\$49,999 | |
| e. \$50,000-\$74,999 | |
| f. \$75,000-\$99,999 | |

APPENDIX I: CONSERVATION PRACTICES CHECKLIST

ID#: _____

Agricultural Conservation Practices Checklist

Conservation Practices:	Definition/Benefit:	In Use (U)/Not in Use (N)
Conservation Cover (CRP/land retirement)	Converting environmentally sensitive acreage to vegetative cover to reduce soil erosion, improve water quality, and enhance forest and wetland resources.	
Conservation tillage (no-till, strip-till, ridge-till, mulch-till)	Soil cultivation that leaves the previous year's crop residue on fields before and after planting the next crop to reduce soil erosion and runoff.	
Buffer/filter strips	Vegetation (grasses, trees, and shrubs) planted and maintained adjacent to streams, ditches and lakes that filters water, stabilizes the stream bank, and provides habitat for wildlife.	
Terraces	An earthen embankment, ridge, or ridge-and-channel built across a slope to intercept runoff water and reduce soil erosion.	
Side water inlets	Include rock inlets, drop inlets (standpipe), coil tile inlets, or rock weirs that temporarily store water, settle sediment and nutrients, and reduce stream erosion and flow from on-field drainage.	
Water and sediment control basins	A series of small earthen ridge-and-channels or embankments built across a watercourse within a field to trap agricultural runoff water and sediment.	
Drainage water management	Technologies and methods that remove excess water from fields while reducing nitrates and other potential pollutants. Includes controlled drainage, shallow drainage, bioreactors, saturated buffers, rock inlets, storage basins, ditch designs.	
Wetland restoration/enhancement	Wetlands store water in landscape depressions, reducing the volume of water delivered to surface waters. Wetlands also filter water and remove nitrogen from runoff.	
Ag waste management facility/system	A properly designed and installed pit, lagoon, or above-ground structure that safely holds agricultural waste.	
Rotation grazing	Raising livestock on subdivided pastures to prevent overgrazing while managing perennial grassland cover.	

[Agricultural Conservation Practices: Practices on agricultural lands that prevent and/or minimize degradation of ground and surface water](#)

APPENDIX J: FOCUS GROUP BACKGROUND INFORMATION

Red River Basin focus Group/Workshop Background Information Form (05-07-13)

We would like to know more about your background. This information will only be used as group data and will remain completely confidential.

1. Are you _____ female _____ male?

2. What is your year of birth? _____

3. Which answer best describes where you lived longest while growing up? (Check one)

- ☐ Rural (farm)
- ☐ Rural (non-farm)
- ☐ Small Town (<10,000)
- ☐ Large Town (10,000 - 100,000)
- ☐ City (>100,000)
- ☐ Suburban Area

4. How long have you lived within 50 miles of your current residence? _____ years

5. What is the highest level of formal education you have completed? (Check one)

- ☐ 8th grade or less
- ☐ Some high school
- ☐ High school graduate or GED
- ☐ Some college, business or trade school
- ☐ College graduate
- ☐ Some graduate school
- ☐ Masters, doctoral or professional degree

6. In what ethnicity and race would you place yourself?

Ethnicity ☐ Hispanic or Latino
 ☐ Not Hispanic or Latino

Race ☐ American Indian or Alaska Native
 ☐ Asian
 ☐ Black or African American
 ☐ Native Hawaiian or other Pacific Islander
 ☐ White

10. What is your occupation? _____

11. With what organization/agency are you employed?

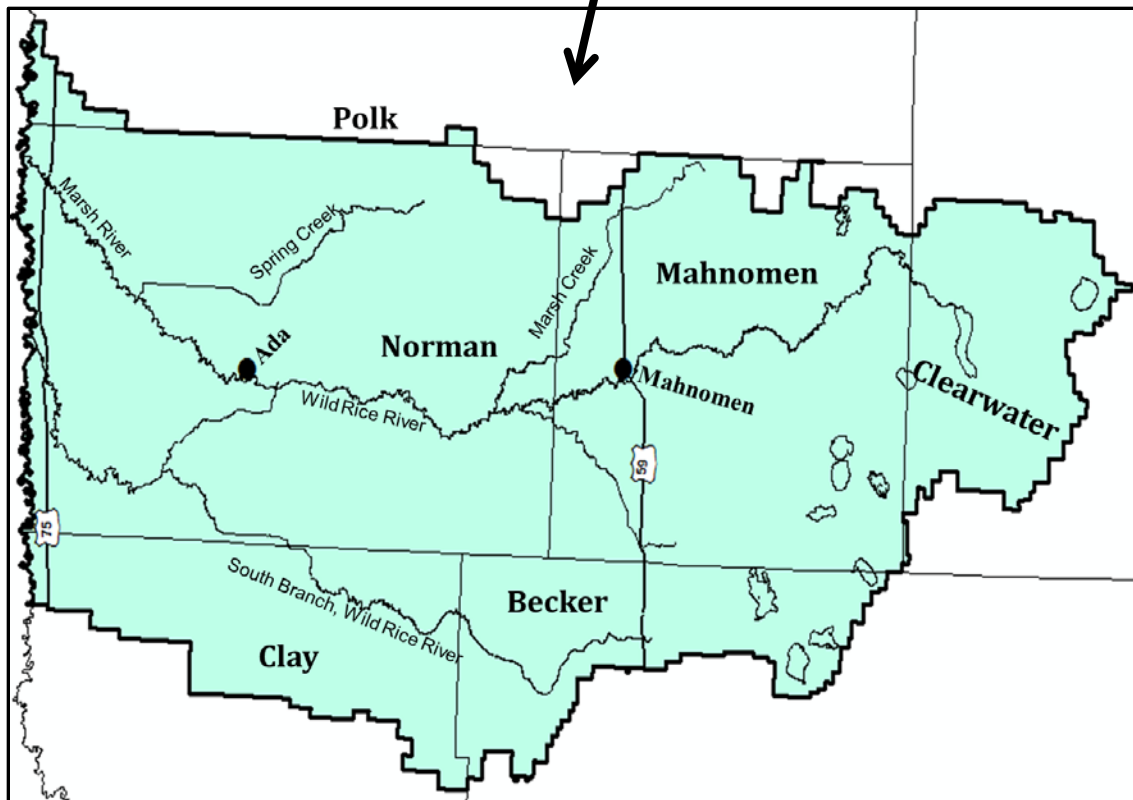
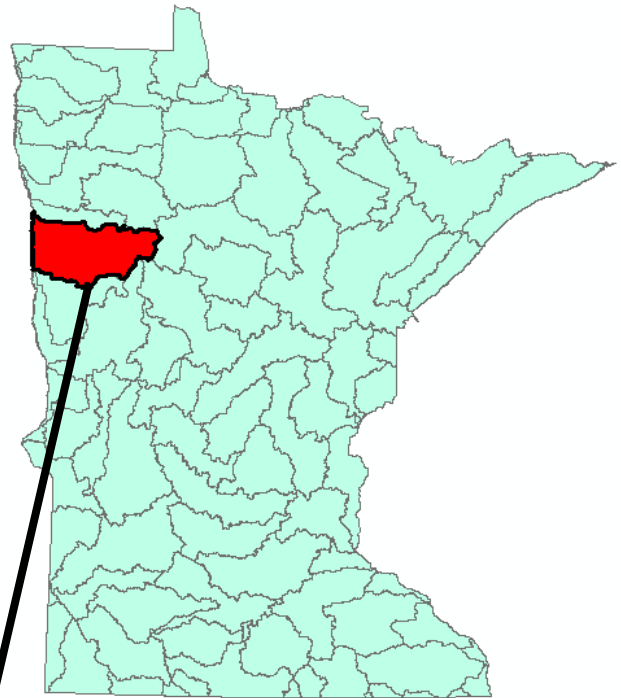
12. How many years have you been employed by this organization/agency? _____

APPENDIX K: WILD RICE WATERSHED DISTRICT MAP

The Wild Rice Watershed District

The **District** boundaries include portions of the Eastern Wild Rice River watershed and the Elm-Marsh Rivers watershed. These watersheds are part of the Red River Basin.

A **watershed** is an area of land that drains water and suspended or dissolved materials to a common outlet at some point along a stream or river. The natural watershed drainage area can be altered by engineered drainage networks.

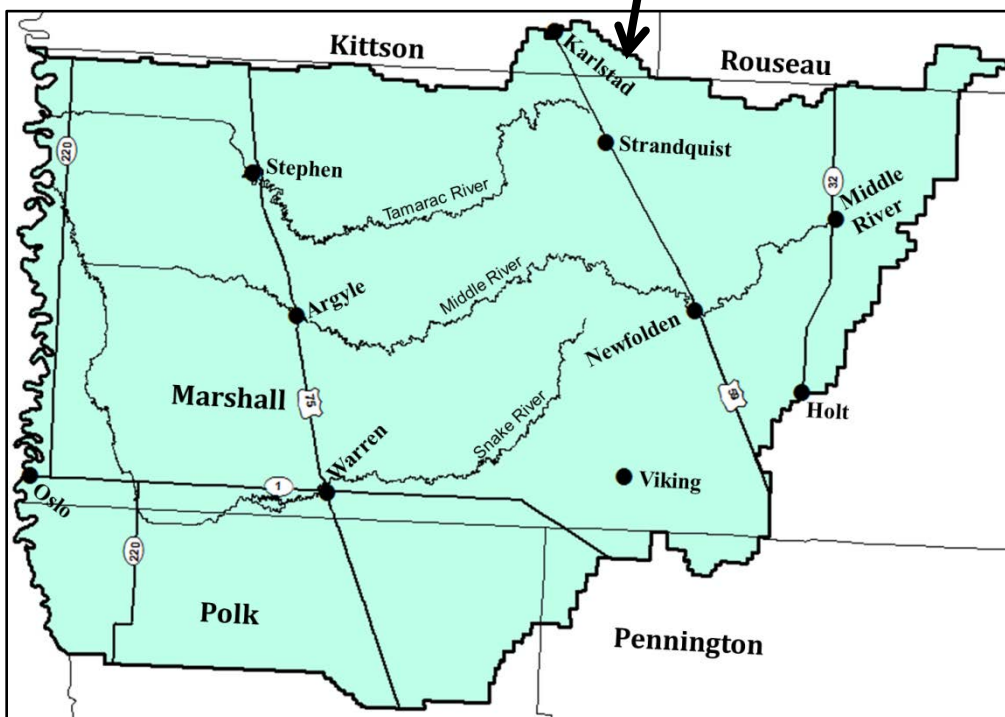
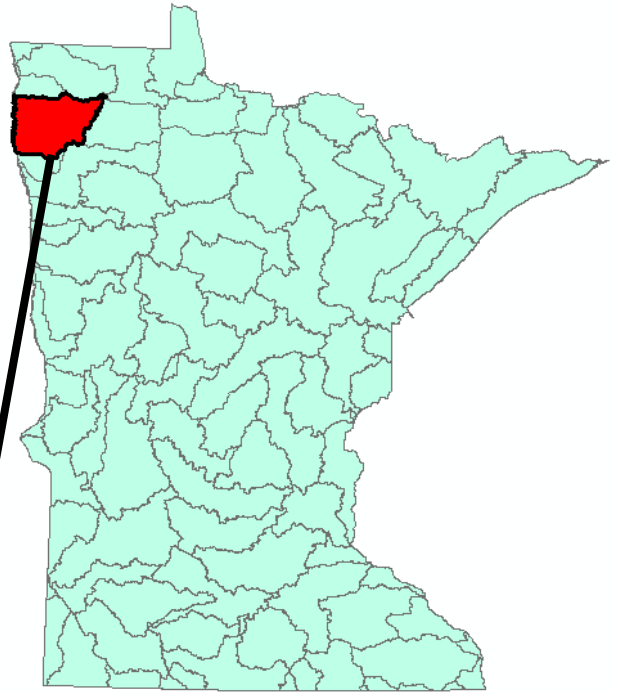


APPENDIX L: MIDDLE SNAKE TAMARAC RIVERS WATERSHED DISTRICT MAP

The Middle Snake Tamarac Rivers Watershed District

The **District** boundaries include portions of the Middle River, Snake River and Tamarac River watersheds. These watersheds are part of the Red River Basin.

A **watershed** is an area of land that drains water and suspended or dissolved materials to a common outlet at some point along a stream or river. The natural watershed drainage area can be altered by engineered drainage networks.



APPENDIX M: SURVEY QUESTIONNAIRE

Red River Basin Rural Landowner Survey



Department of Forest Resources
University of Minnesota
St. Paul, Minnesota



Before you begin:

We are conducting this survey to **better understand rural landowner and farmer opinions and practices** and to improve conservation programming in rural areas. **This survey is voluntary and confidential.** It should take **about 20 minutes to complete** this questionnaire. Please answer the questions as completely as possible.

As you complete the survey, please keep in mind the following definitions:

Buffer/filter strip: A 50-foot wide (or more) strip of vegetation (grasses, trees, and shrubs) planted and maintained adjacent to streams, ditches and lakes that filters water, stabilizes the stream bank, and provides wildlife habitat.

Conservation drainage management: Technologies and practices that remove excess water from lands while reducing potential pollutants (includes controlled drainage, shallow drainage, bioreactors, saturated buffers, rock inlets, storage basins, and ditch designs).

Conservation cover: Converting environmentally sensitive areas to vegetative cover to reduce soil erosion, improve water quality, and enhance forest and wetland resources (includes Conservation Reserve Program and land retirement).

Conservation tillage: Soil cultivation that leaves the previous year's crop residue on fields before and after planting the next crop to reduce soil erosion and surface runoff (includes no, minimum, strip, ridge, mulch-till).

Once you've completed the survey:

Please fold it in thirds and mail it back in the enclosed self-addressed stamped envelope.

Thank you for your help!

I. Perspectives on Your Community

First, we would like to know your thoughts on your community.

1. Approximately how many years have you lived in your current community? _____

2. When you think of your community, what primarily comes to mind? *(Please check one)*

☐ Nearest neighbors ☐ Township ☐ City ☐ County ☐ Watershed

3. How important are each of the following as guiding principles in your life? *(Please circle one number for each row)*

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
a. To identify myself as a member of the community.	1	2	3	4	5
b. To be different from members of the community.	1	2	3	4	5
c. To cooperate with members of the community.	1	2	3	4	5
d. To pursue my personal goals even if they conflict with broader community goals.	1	2	3	4	5

II. Perspectives on the Environment

Next, we would like to know your thoughts on the natural environment.

4. How important are each of the following as guiding principles in your life? *(Please circle one number for each row)*

	Not at all important	Slightly important	Moderately important	Very important	Extremely important
a. To preserve nature for its own sake.	1	2	3	4	5
b. To conserve natural resources for human use.	1	2	3	4	5
c. To use natural resources for personal income.	1	2	3	4	5
d. To protect nature for human health and well-being.	1	2	3	4	5
e. To maintain unity with nature.	1	2	3	4	5
f. To protect private property rights.	1	2	3	4	5

III. Perspectives on Water Resources (Streams, Lakes, Wetlands and Groundwater)

In the next section, we ask more specific questions related to your perspectives on water resources (including streams, lakes, wetlands and groundwater).

5. How familiar are you with water resource issues in your watershed? *[see enclosed watershed map]*

☐ Not at all familiar ☐ Slightly familiar ☐ Moderately familiar ☐ Very familiar

6. Before this survey, did you know your property is in the watershed shaded on the map?

☐ Yes ☐ No ☐ My property is not in the shaded watershed

7. To what extent do you agree or disagree with the following statements? (Please circle one number for each row)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. Water resource protection will threaten jobs for people like me.	-2	-1	0	1	2
b. Laws to protect the environment limit my choices and personal freedom.	-2	-1	0	1	2
c. Excessive water runoff affects human health.	-2	-1	0	1	2
d. Excessive water runoff causes soil and nutrient loss.	-2	-1	0	1	2
e. Conservation practices protect aquatic life.	-2	-1	0	1	2
f. Conservation practices contribute to quality of life in my community.	-2	-1	0	1	2
g. Conservation drainage management reduces water runoff from farmland.	-2	-1	0	1	2
h. Drainage tiling increases crop yield.	-2	-1	0	1	2
i. Drainage tiling contributes to higher water flows downstream.	-2	-1	0	1	2
j. Conservation tillage decreases crop yield.	-2	-1	0	1	2
k. Water resources in the Red River Basin are adequately protected.	-2	-1	0	1	2
l. Water resources in Minnesota need better protection.	-2	-1	0	1	2

8. To what extent do you agree or disagree with the following statements? (Please circle one number for each row)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. It is my personal responsibility to help protect water resources.	-2	-1	0	1	2
b. It is my personal responsibility to make sure that what I do on the land doesn't contribute to water resource problems.	-2	-1	0	1	2
c. Landowners upstream should be responsible for protecting water resources downstream.	-2	-1	0	1	2
d. The federal government should be responsible for protecting water resources.	-2	-1	0	1	2
e. The state government should be responsible for protecting water resources.	-2	-1	0	1	2
f. Local government should be responsible for protecting water resources.	-2	-1	0	1	2
g. Urban residents in the Red River Basin should be responsible for protecting water resources.	-2	-1	0	1	2
h. Farmers in the Red River Basin should be responsible for protecting water resources.	-2	-1	0	1	2

9. In your opinion, how much of a problem are the following water pollutants/issues in your watershed [see map]? (Please circle one number for each row)

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Sediment (cloudiness)	1	2	3	4	DK
b. Phosphorus	1	2	3	4	DK
c. Nitrogen in surface water	1	2	3	4	DK
d. Nitrogen in drinking water	1	2	3	4	DK
e. Flooding	1	2	3	4	DK
f. Drought	1	2	3	4	DK
g. <i>E. coli</i> (bacteria)	1	2	3	4	DK
h. Pesticides	1	2	3	4	DK
i. Herbicides	1	2	3	4	DK
j. Soil erosion	1	2	3	4	DK

10. In your opinion, how much of a problem are the following sources of potential water pollutants/issues in your watershed [see map]? (Please circle one number for each row)

	Not a problem	Slight problem	Moderate problem	Severe problem	Don't know
a. Industrial discharge to streams, rivers, and lakes	1	2	3	4	DK
b. Urban land development	1	2	3	4	DK
c. Improperly sized/maintained septic systems	1	2	3	4	DK
d. Soil erosion from farmland	1	2	3	4	DK
e. Wind erosion	1	2	3	4	DK
f. Stream bank erosion	1	2	3	4	DK
g. Fertilizer management for lawn/turf care	1	2	3	4	DK
h. Fertilizer management for crop production	1	2	3	4	DK
i. Livestock operations	1	2	3	4	DK
j. Tile drainage	1	2	3	4	DK
k. Surface ditch drainage	1	2	3	4	DK
l. Grass clippings and leaves entering storm drains	1	2	3	4	DK
m. Urban/suburban water runoff	1	2	3	4	DK
n. Unregulated contaminants (e.g., pharmaceuticals, personal care products)	1	2	3	4	DK
o. Natural causes (e.g., natural erosion, wildlife)	1	2	3	4	DK
p. Increased frequency or intensity of storms	1	2	3	4	DK

11. To what extent do you agree or disagree with the following statements? (Please circle one number for each row)

I am concerned about the consequences of excessive water runoff for...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. My or my family's health	-2	-1	0	1	2
b. Future generations	-2	-1	0	1	2
c. Wildlife	-2	-1	0	1	2
d. Farmland	-2	-1	0	1	2
e. Aquatic life	-2	-1	0	1	2
f. People in my community	-2	-1	0	1	2

12. To what extent do you agree or disagree with the following statements? (Please circle one number for each row)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. My use of a conservation practice contributes to healthy water resources.	-2	-1	0	1	2
b. What I do on the land does not make much difference in overall water resource health.	-2	-1	0	1	2
c. If I wanted to, I have the ability to change the way I use the land to protect water resources.	-2	-1	0	1	2
d. I have the knowledge and skills I need to use conservation practices on the land.	-2	-1	0	1	2
e. I have the financial resources I need to use conservation practices on the land.	-2	-1	0	1	2
f. I have the equipment I need to adopt a new conservation practice.	-2	-1	0	1	2
g. I do not have the time to use conservation practices	-2	-1	0	1	2
h. Farmers in my community have the ability to work together to change land use practices.	-2	-1	0	1	2
i. My community has the financial resources it needs to protect water resources.	-2	-1	0	1	2
j. My community has the leadership it needs to protect water resources.	-2	-1	0	1	2

IV. Conservation Practices and Community Engagement

Now, we have a few questions about your conservation practices and community engagement.

13. Do you use your land/property or rent land/property for agricultural production? *(Please check yes or no)*

☐ Yes

☐ No **(if no, skip to question # 15)**

14. Please identify the extent to which you are currently engaged in the following practices. *(Please circle one response for each row)*

	Not at all	In one to a few locations	In about half of the possible locations	In most possible locations	In all possible locations
a. I maintain a buffer/filter strip along streams and ditches on individual fields.	no	few	half	most	all
b. I use conservation drainage management practices on individual fields.	no	few	half	most	all
c. I use conservation tillage practices on individual fields.	no	few	half	most	all
d. The farm has land in conservation cover (e.g., Conservation Reserve Program, land retirement program).	no	few	half	most	all
e. I use drainage tiles on individual fields.	no	few	half	most	all
f. I have a drainage water management plan.	no	few	half	most	all
g. I protect wetlands on the farm.	no	few	half	most	all
h. I have planted trees as a windbreak on the farm.	no	few	half	most	all
i. I follow a comprehensive nutrient management plan on the farm.	no	few	half	most	all

15. How often have you engaged in the following actions in the past 12 months? *(Please circle one response for each row)*

In the <u>past 12 months</u> how often have you...	Never	Every few months	Every month	Twice monthly	Weekly
a. Volunteered for community organizations or events?	0	1	2	3	4
b. Heard about a water resource protection initiative?	0	1	2	3	4
c. Participated in water resource protection initiative?	0	1	2	3	4
d. Worked with other community members to protect water resources?	0	1	2	3	4
e. Talked to others about conservation practices?	0	1	2	3	4
f. Attended a meeting or public hearing about water?	0	1	2	3	4
g. Taken a leadership role around water resource conservation in the community.	0	1	2	3	4

16. Please rate your intentions to engage in the following actions in the next 12 months. (Please circle one number for each row)

In the <u>next 12 months</u> , I intend to...	Most certainly not	Probably not	Uncertain	Probably will	Most certainly will
a. Learn more about water resource issues in my watershed.	-2	-1	0	1	2
b. Talk to others about conservation practices.	-2	-1	0	1	2
c. Work with other community members to protect water resources.	-2	-1	0	1	2
d. Attend a meeting or public hearing about water	-2	-1	0	1	2
e. Contact my watershed district/management organization about water resource initiatives.	-2	-1	0	1	2
f. Learn more about buffer/filter strips.	-2	-1	0	1	2
g. Learn more about conservation drainage management practices.	-2	-1	0	1	2
h. Learn more about MN Dept. of Agriculture's Ag Water Quality Certification program.	-2	-1	0	1	2
i. Use conservation tillage on the farm.	-2	-1	0	1	2
j. Have land in conservation cover (e.g., Conservation Reserve Program).	-2	-1	0	1	2
k. Maintain buffer/filter strips along all streams and ditches.	-2	-1	0	1	2
l. Install tile drainage systems on the farm.	-2	-1	0	1	2
m. Plant trees as windbreak on the farm	-2	-1	0	1	2

Next, we would like to know to what extent you feel a *personal obligation* to engage in the following actions.

17. To what extent do you agree or disagree with the following statements? (Please circle one number for each row)

I feel a personal obligation to...	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. Maintain my land/farm in a way that <u>does not</u> contribute to water resource problems.	-2	-1	0	1	2
b. Talk to others about conservation practices.	-2	-1	0	1	2
c. Learn more about water resources in my watershed.	-2	-1	0	1	2
d. Work with other community members to protect water resources.	-2	-1	0	1	2
e. Attend meetings or public hearings about water.	-2	-1	0	1	2
f. Be a leader in the community in water resource conservation.	-2	-1	0	1	2

18. To what extent do the following individuals or groups influence your decisions about conservation on your land? (Please circle one number for each row)

	Not at all	Slightly	Moderately	A lot	Don't know/Not applicable
a. My family	1	2	3	4	DK/NA
b. Farmers	1	2	3	4	DK/NA
c. My neighbors	1	2	3	4	DK/NA
d. Environmental advocacy organizations	1	2	3	4	DK/NA
e. My county's Soil and Water Conservation District	1	2	3	4	DK/NA
f. My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	1	2	3	4	DK/NA
g. My local watershed district/ watershed management organization	1	2	3	4	DK/NA
h. University researchers	1	2	3	4	DK/NA
i. The MN Department of Natural Resources	1	2	3	4	DK/NA
j. The MN Pollution Control Agency	1	2	3	4	DK/NA
k. The MN Department of Agriculture	1	2	3	4	DK/NA
l. The Farm Service Agency	1	2	3	4	DK/NA
m. My local MN extension agent	1	2	3	4	DK/NA
n. My county's Farm Bureau	1	2	3	4	DK/NA
o. Agricultural commodity associations	1	2	3	4	DK/NA
p. Certified crop advisors (CCA)	1	2	3	4	DK/NA
q. Seed/input dealer	1	2	3	4	DK/NA
r. Farmer's Union	1	2	3	4	DK/NA
s. My local co-op	1	2	3	4	DK/NA
t. My agronomist/agricultural advisor	1	2	3	4	DK/NA
u. Other (please specify): _____	1	2	3	4	DK/NA

19. From the previous list (Question 18, a-u), what are your three most trusted sources of information regarding water quality issues and solutions? (Please list in order of first, second, and third most trusted)

1. _____ 2. _____ 3. _____

20. How likely or unlikely would you be to adopt or continue to use conservation practices under the following conditions? (Please circle one number for each row)

	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely
a. I knew more about how to implement and maintain conservation practices.	-2	-1	0	1	2
b. I knew more about the wildlife benefits of conservation practices.	-2	-1	0	1	2
c. I had help with the physical labor of implementing and maintaining conservation practices.	-2	-1	0	1	2
d. I had access to cost share resources to help me adopt conservation practices.	-2	-1	0	1	2
e. I could talk to other landowners or farmers who are using conservation practices.	-2	-1	0	1	2
f. I could attend a workshop or field day on conservation practices.	-2	-1	0	1	2
g. I could be enrolled in a registry program that recognizes local conservation stewards.	-2	-1	0	1	2
h. My neighbors maintained conservation practices.	-2	-1	0	1	2
i. There were regulations that mandated using a conservation practice.	-2	-1	0	1	2
j. Conservation programs were more flexible.	-2	-1	0	1	2
k. I could get higher payments for adopting conservation practices.	-2	-1	0	1	2
l. I could learn how to maintain conservation practices for erosion control.	-2	-1	0	1	2
m. I could learn how to maintain conservation practices for soil conservation.	-2	-1	0	1	2
n. I had evidence that the conservation practice improved water resources.	-2	-1	0	1	2
o. I was compensated for lost crop production because of conservation practices.	-2	-1	0	1	2
p. Conservation program requirements were less complex.	-2	-1	0	1	2
q. I had evidence that conservation practices did not reduce crop yield.	-2	-1	0	1	2

21. To what extent do you agree or disagree with the following statements? (Please circle one number for each row)

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
a. People who are important to me expect me to maintain my land/farm in a way that doesn't contribute to water resource problems.	-2	-1	0	1	2
b. People who are important to me maintain their land/farm in a way that doesn't contribute to water resource problems.	-2	-1	0	1	2
c. People who are important to me expect me to be a leader in the community in water resource conservation.	-2	-1	0	1	2
d. People who are important to me are leaders in the community in water resource conservation.	-2	-1	0	1	2
e. In general, people who are important to me influence my decisions and behavior.	-2	-1	0	1	2
f. I generally want to do what people who are important to me want me to do.	-2	-1	0	1	2

V. Water Resource Management in Minnesota

Next, please consider your attitudes toward potential water resource management actions in Minnesota.

22. To what extent do you support or oppose the following potential water resource management actions in Minnesota? (Please circle one number for each row)

	Strongly oppose	Somewhat oppose	Neither oppose nor support	Somewhat support	Strongly support
a. Conducting more water research and monitoring.	-2	-1	0	1	2
b. Enforcing existing land use laws and regulations.	-2	-1	0	1	2
c. Increasing land use laws and regulations	-2	-1	0	1	2
d. Expanding programs that offer financial incentives to property owners/farmers for conservation practices.	-2	-1	0	1	2
e. Streamlining existing programs that offer financial incentives to property owners/farmers for conservation.	-2	-1	0	1	2
f. Promoting voluntary conservation practices through increased education and outreach programs.	-2	-1	0	1	2
g. Coordinating land use and water planning and management across communities at a watershed scale.	-2	-1	0	1	2
h. Engaging more citizens in local land use and water resource decision making.	-2	-1	0	1	2

VI. Information about You and Your Land/Farm

Finally, we want to know a little bit about you in order to better understand who responded to this survey. Remember, your responses to all of the survey questions are confidential.

23. How do you use water resources in your watershed? (Check all that apply)

- | | |
|--|---|
| <input type="checkbox"/> Drinking water | <input type="checkbox"/> Irrigation |
| <input type="checkbox"/> Canoeing/kayaking/other boating | <input type="checkbox"/> Picnicking and family gatherings |
| <input type="checkbox"/> Fishing | <input type="checkbox"/> Observing wildlife |
| <input type="checkbox"/> Swimming | <input type="checkbox"/> Experiencing scenic beauty |

24. Does the land you own or rent touch a ditch, stream, lake, or river? (Please check yes or no)

- ☐ Yes ☐ No

25. How would you characterize the quality of water in the ditch, stream, lake, or river closest to you? (Please check one box)

- ☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good ☐ Don't know

26. How would you characterize the quality of water in the Red River? (Please check one box)

- ☐ Very poor ☐ Poor ☐ Fair ☐ Good ☐ Very good ☐ Don't know

27. What is your experience with programs that offer financial incentives to farmers for conservation practices? (Please check one box)

- ☐ Not relevant for my property ☐ Never heard of any ☐ Familiar but not enrolled ☐ Currently enrolled

28. Please characterize the ownership arrangement and size of your property. (Please check all that apply and include acreage)

- | Ownership | Approximate Acreage |
|---|---------------------|
| <input type="checkbox"/> I own and manage my own land. | _____ |
| <input type="checkbox"/> I rent land <u>to</u> another party. | _____ |
| <input type="checkbox"/> I rent land <u>from</u> another party. | _____ |
| <input type="checkbox"/> Other (please specify): _____ | _____ |

29. Who makes the management decisions on the land? (Please check one box)

- ☐ I make my own decisions.
- ☐ I leave it up to my renter.
- ☐ I leave it up to the landowner/property owner.
- ☐ I work together with the renter/landowners to make decisions.

30. In what year were you born? _____

31. What is your gender? ☐ Male ☐ Female

32. What is the highest level of formal education you have completed? (Please check one box)

- | | |
|--|---|
| <input type="checkbox"/> Did not finish high school | <input type="checkbox"/> College bachelor's degree |
| <input type="checkbox"/> Completed high school | <input type="checkbox"/> Some college graduate work |
| <input type="checkbox"/> Some college but no degree | <input type="checkbox"/> Completed graduate degree (Masters or PhD) |
| <input type="checkbox"/> Associate degree or vocational degree | |

33. Are you of Hispanic, Latino, or Spanish origin? (Please check yes or no) ☐ Yes ☐ No

34. How would you describe your race? (Please check all that apply)

- | | | |
|---|---|--|
| <input type="checkbox"/> White | <input type="checkbox"/> Native Hawaiian | <input type="checkbox"/> Korean |
| <input type="checkbox"/> Black or African American | <input type="checkbox"/> Pacific Islander | <input type="checkbox"/> Vietnamese |
| <input type="checkbox"/> American Indian of Alaska Native | <input type="checkbox"/> Chinese | <input type="checkbox"/> Filipino |
| <input type="checkbox"/> Asian Indian | <input type="checkbox"/> Japanese | <input type="checkbox"/> Other race (Please specify) |
- _____

35. Which of the following best describes your total household income from all sources in 2012 before taxes?
(Please check one box)

- | | | |
|--|--|--|
| <input type="checkbox"/> Under \$20,000 | <input type="checkbox"/> \$75,000 - \$99,999 | <input type="checkbox"/> \$200,000 - \$249,999 |
| <input type="checkbox"/> \$20,000 - \$49,999 | <input type="checkbox"/> \$100,000 - \$149,999 | <input type="checkbox"/> \$250,000 - \$299,999 |
| <input type="checkbox"/> \$50,000 - \$74,999 | <input type="checkbox"/> \$150,000 - \$199,999 | <input type="checkbox"/> \$300,000 or more |

36. Approximately what percentage of your income is dependent on agricultural production? ____%

37. How would you describe your political affiliation?

- ☐ Republican ☐ Democrat ☐ Independent ☐ Other (Please specify) _____ ☐ none

38. Do you have any other comments about your community or water resource management?

Thank you for your help!

Please complete the survey, fold it in thirds, and mail it back in the enclosed self-addressed stamped envelope.

If you have questions please contact Dr. Mae Davenport, Department of Forest Resources, 115 Green Hall, 1530 Cleveland Avenue N., St. Paul, MN 55108. Phone: (612) 624-2721 or by email at mdaven@umn.edu. Cover Photo: V. Perry

APPENDIX N: COVER LETTERS

August 14, 2014

[First Name] [Last Name]
[Street Address]
[City] [State] [Zip code]

Wild Rice Watershed District Survey Information and Consent Form

Dear [First Name] [Last Name],

I am writing to ask for your help in a study about rural landowners and water resources. The study is being conducted by Mae Davenport, Department of Forest Resources, University of Minnesota and is being funded by the Northwest Minnesota Foundation. I am contacting you because you are a landowner in the Wild Rice Watershed District and we believe you have an important perspective to share. The purpose of this survey is to learn more about how landowners in the Red River Valley perceive and interact with their community, their environment, and specifically water resources.

The findings from this study will be used to help resource managers and community leaders better understand landowners' views and to facilitate communication and outreach programs in the region. Your input will inform water and land management decisions in the Wild Rice Watershed District. We are only contacting a random sample of landowners in this area, so it is important that we hear from you! For your reference, a map is enclosed displaying the major municipalities and counties within the Wild Rice Watershed District. We have also enclosed a two-dollar bill as a token of appreciation to thank you in advance for your help with this study.

This survey is voluntary and completely confidential. The risks of participating in this study are minimal. There are no direct benefits to you for participating in this study. You are free to withdraw at any time. Completion of this survey indicates your voluntary consent to participate. Your decision to participate will not affect your current or future relationship with the University of Minnesota. The ID # on the front page of your survey is used to help us track mailings and will ensure that your name is never affiliated with your responses. Please answer the questions as completely as possible. It should take you only about 20 minutes to complete the questionnaire. Once you have **completed the questionnaire, fold it in thirds and mail it back in the enclosed self-addressed, postage-paid envelope.**

We would be happy to answer any questions or listen to any comments you may have about this study. Please feel free to contact me by phone at 612-624-2721, or by email at mdaven@umn.edu. If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Research Subjects' Advocate Line, D-528 Mayo, 420 Delaware Street S.E., Minneapolis, Minnesota, 55455; telephone [\(612\) 625-1650](tel:612-625-1650).

I hope you enjoy completing the questionnaire and I look forward to receiving your response.

Sincerely,

Mae Davenport
Associate Professor

August 14, 2014

[First Name] [Last Name]
[Street Address]
[City] [State] [Zip code]

Middle Snake Tamarac Rivers Watershed District Survey Information and Consent Form

Dear [First Name] [Last Name],

I am writing to ask for your help in a study about rural landowners and water resources. The study is being conducted by Mae Davenport, Department of Forest Resources, University of Minnesota and is being funded by the Northwest Minnesota Foundation. I am contacting you because you are a landowner in the Middle Snake Tamarac Rivers Watershed District and we believe you have an important perspective to share. The purpose of this survey is to learn more about how landowners in the Red River Valley perceive and interact with their community, their environment, and specifically water resources.

The findings from this study will be used to help resource managers and community leaders better understand landowners' views and to facilitate communication and outreach programs in the region. Your input will inform water and land management decisions in the Middle Snake Tamarac Rivers Watershed District. We understand that this may be a busy time of the year for you; so we really appreciate you taking the time to help us with this study. It should take you only about 20 minutes to complete the questionnaire. We are only contacting a random sample of landowners in this area; so it is important that we hear from you! For your reference, a map is enclosed displaying the major municipalities and counties within the Middle Snake Tamarac Rivers Watershed District. We have also enclosed a two-dollar bill as a token of appreciation to thank you in advance for your help with this study.

This survey is voluntary and completely confidential. The risks of participating in this study are minimal. There are no direct benefits to you for participating in this study. You are free to withdraw at any time. Completion of this survey indicates your voluntary consent to participate. Your decision to participate will not affect your current or future relationship with the University of Minnesota. The ID # on the front page of your survey is used to help us track mailings, ensuring that your name is never affiliated with your responses. Please answer the questions as completely as possible. Once you have **completed the questionnaire, fold it in thirds and mail it back in the enclosed self-addressed, postage-paid envelope.**

We would be happy to answer any questions or listen to any comments you may have about this study. Please feel free to contact me by phone at 612-624-2721, or by email at mdaven@umn.edu. If you have any questions or concerns regarding the study and would like to talk to someone other than the researcher(s), you are encouraged to contact the Research Subjects' Advocate Line, D-528 Mayo, 420 Delaware Street S.E., Minneapolis, Minnesota, 55455; telephone [\(612\) 625-1650](tel:6126251650).

I hope you enjoy completing the questionnaire and I look forward to receiving your response.

Sincerely,

Mae Davenport
Associate Professor

APPENDIX O: REMINDER LETTERS

[Date]

[Full Address]

Dear [First name Last name],

A few weeks ago I sent you a questionnaire that asked about your perspectives on your community and its water resources. If you have already returned your questionnaire, thank you for your response. We sincerely appreciate your input!

If you have not yet responded, I am writing again because of the importance your participation is to the study and its intended outcomes. We understand that this may be a busy time of the year for you; so we really appreciate you taking the time to help us with this study. It should take you only about 20 minutes to complete the questionnaire. The responses we have already received from other landowners in your watershed show a range of beliefs about water resources and support for watershed management initiatives. We want to ensure that your opinions are represented, too! We are only contacting a sample of landowners in your area, so it's important that we hear from you.

The purpose of this survey is to learn more about how landowners in the Red River Valley perceive and interact with their community, their environment, and specifically water resources. Your input will inform water and land management decisions in the Wild Rice Watershed District. The study is being conducted by Mae Davenport, Department of Forest Resources, University of Minnesota and is being funded by the Northwest Minnesota Foundation.

This survey is voluntary and completely confidential. The ID# on the front page of your survey is used to help us track mailings and will ensure that your name is never affiliated with your responses. Please answer the questions as completely as possible. Once you have **completed the questionnaire, fold it in thirds and mail it back in the enclosed self-addressed postage-paid envelope.**

We would be happy to answer any questions or listen to any comments you may have about this study. Please feel free to contact me by phone at (612) 624-2721, or by e-mail at mdaven@umn.edu.

I hope you enjoy completing the questionnaire and look forward to receiving your response.

Sincerely,

Mae Davenport
Associate Professor

[Date]

[Full Address]

Dear [First name Last name],

A few weeks ago I sent you a questionnaire that asked about your perspectives on your community and its water resources. If you have already returned your questionnaire, thank you for your response. We sincerely appreciate your input!

If you have not yet responded, I am writing again because of the importance your participation is to the study and its intended outcomes. We understand that this may be a busy time of the year for you; so we really appreciate you taking the time to help us with this study. It should take you only about 20 minutes to complete the questionnaire. The responses we have already received from other landowners in your watershed show a range of beliefs about water resources and support for watershed management initiatives. We want to ensure that your opinions are represented, too! We are only contacting a sample of landowners in your area, so it's important that we hear from you.

The purpose of this survey is to learn more about how landowners in the Red River Valley perceive and interact with their community, their environment, and specifically water resources. Your input will inform water and land management decisions in the Middle Snake Tamarac Rivers Watershed District. The study is being conducted by Mae Davenport, Department of Forest Resources, University of Minnesota and is being funded by the Northwest Minnesota Foundation.

This survey is voluntary and completely confidential. The ID# on the front page of your survey is used to help us track mailings and will ensure that your name is never affiliated with your responses. Please answer the questions as completely as possible. Once you have **completed the questionnaire, fold it in thirds and mail it back in the enclosed self-addressed postage-paid envelope.**

We would be happy to answer any questions or listen to any comments you may have about this study. Please feel free to contact me by phone at (612) 624-2721, or by e-mail at mdaven@umn.edu.

I hope you enjoy completing the questionnaire and look forward to receiving your response.

Sincerely,

Mae Davenport
Associate Professor

APPENDIX P: REPLACEMENT COVER LETTER

[Date]

[Full Address]

Dear [First name Last name],

Spring is a busy time for landowners, and I understand how valuable your time is. I am hoping you would be able to give about 20 minutes of your time to help us collect important information about landowner perceptions of water resources and conservation programs by completing a questionnaire. If you have already returned your questionnaire, thank you for your response. We sincerely appreciate your input!

If you have not yet responded, I am writing again because of the importance your participation is to the study and its outcomes. The responses we have already received from other landowners in your watershed show a range of beliefs about water resources and support for watershed management initiatives. We want to ensure that your opinions are represented, too! We plan to end the survey in two weeks, so we want to make sure you have the chance to participate and share your opinions.

Your input will inform water and land management decisions across the Red River Basin. The study is being conducted by Mae Davenport, Department of Forest Resources, University of Minnesota and is being funded by the Northwest Minnesota Foundation.

This survey is voluntary and completely confidential. The ID# on the front page of your survey is used to help us track mailings and will ensure that your name is never affiliated with your responses. Please answer the questions as completely as possible. Once you have **completed the questionnaire, fold it in thirds and mail it back in the enclosed self-addressed postage-paid envelope.**

We would be happy to answer any questions or listen to any comments you may have about this study. Please feel free to contact me by phone at (612) 624-2721, or by e-mail at mdaven@umn.edu.

I hope you enjoy completing the questionnaire and look forward to receiving your response.

Sincerely,

Mae Davenport
Associate Professor

APPENDIX Q: SURVEY FINDINGS

Table 1. Survey response rates by watershed

	N	Response Rate
Wild Rice River ^a	237	33.0%
Middle Snake Tamarac Rivers ^b	161	22.2%
Total	398	27.6%

^aIncludes wave 1 and wave 2 respondents^bIncludes wave 1 respondents only

Table 2. Respondents' socio-demographic characteristics

Socio-Demographic Characteristics		N	Percent
Gender	Male	327	83.8
	Female	63	16.2
Ethnicity (Hispanic, Latino or Spanish origin)	Yes	5	1.4
	No	362	98.6
Race	White	376	94.5
	Other Race	22	5.5
Age	Median	63	-
	Minimum	24	-
	Maximum	94	-
Years lived in community	Median	50	-
	Maximum	92	-
	Minimum	<1	-
Formal education	Did not finish high school	17	4.4
	Completed high school	95	24.4
	Some college but no degree	74	19.0
	Associate or vocational degree	76	19.5
	College bachelor's degree	68	17.4
	Some college graduate work	22	5.6
	Completed graduate degree (MS or PhD)	38	9.7
Household income	Under \$20,000	14	3.9
	\$20,000-\$49,999	73	20.3
	\$50,000-\$74,999	80	22.3
	\$75,000-\$99,999	65	18.1
	\$100,000-\$149,999	65	18.1
	\$150,000-\$199,999	23	6.4
	\$200,000-\$249,999	9	2.5
	\$250,000-\$299,999	7	1.9
	\$300,000 or more	23	6.4

Source: Questions 1, 30, 31, 32, 33, 34, 35; Red River Basin rural landowner survey

Table 3. Respondents' property characteristics

Property Characteristics		N	Percent
Land/property borders a ditch, stream, lake, or river	Yes	340	87.0
	No	51	13.0
Percent income dependent on land/property	0-49.9%	193	53.2
	50% or more	170	46.8
Property used for agricultural production	Yes	269	72.9
	No	100	27.1
Ownership arrangement	I own and manage my own land	254	45.8
	I rent my land <u>to</u> another party	191	34.5
	I rent my land <u>from</u> another party	91	16.4
	Other	18	3.2
Management decisions on land/property	I make own decisions	218	55.9
	I leave it up to my renter	93	23.8
	I leave it up to the landowner/property owner	3	0.8
	I work together with renter/landowner to make decisions	76	19.5

Source: Questions 13, 24, 28, 29, 36; Red River Basin rural landowner survey

Table 4. Respondents' property size

	N	Percent	Median	SD	Under 40 acres ^a	41–150 acres	151–500 acres	501 acres or more
Size of property owned	218	55.9	250	615.04	4.4	31.1	35.5	28.9
Size of property rented out	93	23.8	200	413.44	7.6	28.1	46.2	18.1
Size of property rented	3	0.8	600	1557.58	3.8	15.2	29.1	51.9
Other	76	19.5	120	187.52	35.3	23.5	35.3	5.9

Source: Question 28; Red River Basin rural landowner survey

^aPercent

Survey question: How familiar are you with water resource issues in your watershed?

Table 5. Respondents' familiarity with water resource issues in their watershed

	N	Percent
Not at all familiar	44	11.3
Slightly familiar	115	29.6
Moderately familiar	159	40.9
Very familiar	71	18.3
Total	389	100.0

Source: Question 5; Red River Basin rural landowner survey

Survey question: Before this survey, did you know your property is in the Cannon River watershed?

Table 6. Respondents' knowledge of property ownership in the watershed

	N	Percent
Yes	331	85.3
No	44	11.3
Not in the watershed	13	3.4
Total	388	100.0

Source: Question 6; Red River Basin rural landowner survey

Survey question: How would you characterize the quality of water in the ditch, stream, lake, or river closest to you?

Table 7. Respondents' perceptions of the quality of water in the ditch, stream, lake, or river closest to them

	N	Percent
Very poor	6	1.5
Poor	31	7.9
Fair	77	19.7
Good	132	33.8
Very good	95	24.4
Don't know	49	12.6
Total	390	100.0

Source: Question 25; Red River Basin rural landowner survey

Survey question: How would you characterize the quality of water in the Red River?

Table 8. Respondents' perceptions of the quality of water in the Red River

	N	Percent
Very poor	16	4.1
Poor	97	24.9
Fair	114	29.2
Good	76	19.5
Very good	23	5.9
Don't know	64	16.4
Total	390	100.0

Source: Question 26; Red River Basin rural landowner survey

Survey question: To what extent do you agree or disagree with the following statements?

Table 9. Respondents' concerns about the consequences of excess water runoff

I am concerned about the consequences of excess water runoff for...	N	Mean ^a	SD	Strongly disagree ^b	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Farmland	391	0.73	1.10	5.6	7.9	19.7	41.7	25.1
Future generations	392	0.70	1.14	7.1	7.4	18.9	41.6	25.0
People in my community	392	0.55	1.07	6.1	7.9	28.8	38.8	18.4
Aquatic life	390	0.53	1.11	7.2	9.2	25.9	39.0	18.7
Wildlife	391	0.45	1.15	9.0	9.0	27.9	36.6	17.6
My or my family's health	391	0.28	1.14	9.5	12.3	33.0	31.5	13.8

Source: Question 11; Red River Basin rural landowner survey

^aResponses based on a five-point scale from strongly disagree (-2) to strongly agree (+2).

^bPercent

Survey question: In your opinion, how much of a problem are the following pollutants/issues in your watershed?

Table 10. Respondents' perceptions about pollutants/issues in their watershed

	N	Mean ^a	SD	Not a problem ^b	Slight problem	Moderate problem	Severe problem	Don't know
Flooding	388	2.83	0.97	10.8	19.3	35.3	25.5	9.0
Soil erosion	390	2.58	0.88	8.7	33.8	30.3	14.6	12.6
Sediment (cloudiness)	385	2.41	0.92	13.8	30.6	25.7	10.6	19.2
Pesticides	391	2.25	0.99	18.7	27.4	16.4	10.2	27.4
Herbicides	389	2.25	1.02	20.1	26.0	15.9	11.1	27.0
Phosphorus	383	2.22	0.92	15.4	24.3	17.5	5.7	37.1
Drought	386	2.21	0.94	22.0	32.4	22.8	8.8	14.0
Nitrogen in surface water	383	2.17	0.90	15.7	26.9	15.7	5.5	36.3
Nitrogen in drinking water	384	1.85	0.92	26.6	19.8	9.9	3.9	39.8
<i>E. coli</i> (bacteria)	383	1.79	0.94	25.6	14.4	8.1	3.4	48.6

Source: Question 9; Red River Basin rural landowner survey

^aResponses based on a four-point scale from not a problem (1) to severe problem (4)

^bPercent

Survey question: In your opinion, how much of a problem are the following sources of potential water pollutants/issues in your watershed?

Table 11. Respondents' perceptions about sources of pollutants/issues in their watershed

	N	Mean ^a	SD	Not a problem ^b	Slight problem	Moderate problem	Severe problem	Don't know
Stream bank erosion	387	2.54	0.94	12.1	32.8	27.6	16.3	11.1
Soil erosion from farmland	388	2.33	0.78	11.6	43.6	29.6	5.9	9.3
Wind erosion	390	2.33	0.85	13.8	41.5	26.7	8.5	9.5
Fertilizer management for crop production	388	2.14	0.94	24.7	33.8	19.8	8.5	13.1
Surface ditch drainage	387	2.08	0.92	27.1	34.1	20.2	7.2	11.4
Fertilizer management for lawn/turf care	389	2.05	1.04	32.1	25.4	14.7	10.8	17.0
Increased frequency or intensity of storms	390	2.02	0.91	29.5	27.4	22.8	4.1	16.2
Urban/suburban stormwater runoff	389	1.99	0.96	30.6	28.3	15.2	7.2	18.8
Urban land development	384	1.91	0.94	37.2	25.8	18.8	5.5	12.8
Livestock operations	389	1.90	0.89	33.7	29.8	16.2	4.4	15.9
Tile drainage	387	1.88	0.99	40.1	20.4	16.3	6.7	16.5
Unregulated contaminants (e.g., pharmaceuticals, personal care products)	389	1.83	1.00	35.5	19.0	9.3	6.9	29.3
Industrial discharge to streams, rivers, and lakes	389	1.81	0.93	37.8	26.7	10.3	6.2	19.0
Improperly sized/maintained septic systems	388	1.78	0.89	39.4	24.0	14.4	3.6	18.6
Natural causes (e.g., natural erosion, wildlife)	391	1.78	0.77	34.8	36.3	12.0	2.0	14.8
Grass clippings and leaves entering storm drains	387	1.57	0.80	47.0	22.0	7.5	2.6	20.9

Source: Question 10; Red River Basin rural landowner survey

^aResponses based on a four-point scale from not a problem (1) to severe problem (4)

^bPercent

Survey question: Please identify the extent to which you are currently engaged in the following practices

Table 12. Respondents' current use of practices

	N	Not at all ^a	In one to a few locations	In about half of the possible locations	In most possible locations	In all possible locations
I follow a comprehensive nutrient management plan on the farm.	243	25.1	9.9	7.0	24.3	33.7
I protect wetlands on the farm.	244	19.7	20.1	4.9	25.8	29.5
I use conservation tillage practices on individual fields.	246	13.8	16.3	10.2	40.7	19.1
I have a drainage water management plan.	243	44.0	15.6	5.3	19.8	15.2
I use conservation drainage management practices on individual fields.	244	18.0	26.6	11.9	29.9	13.5
I maintain a buffer/filter strip along streams and ditches on individual fields.	245	21.2	25.7	10.2	29.4	13.5
I have planted trees as a windbreak on the farm.	249	27.7	31.3	9.6	18.1	13.3
The farm has land in conservation cover (e.g., Conservation Reserve Program, land retirement program).	250	50.8	30.8	6.4	6.4	5.6
I use drainage tiles on individual fields.	248	81.0	12.9	4.4	1.6	0.0

Source: Question 14; Red River Basin rural landowner survey; respondents who use land for agricultural production only

^aPercent

Survey question: How often have you engaged in the following actions in the past 12 months?

Table 13. Respondents' civic engagement behavior

In the past 12 months about how often have you...	N	Never^a	Every few months	Every month	Twice monthly	Weekly
Volunteered for community organizations or events?	385	41.0	32.5	15.3	5.7	5.5
Talked to others about conservation practices?	383	38.6	45.4	10.2	3.1	2.6
Heard about a water resource protection initiative?	380	51.1	34.7	9.2	2.9	2.1
Participated in water resource protection initiative?	382	72.8	20.2	5.0	.3	1.8
Worked with other community members to protect water resources?	382	71.7	20.9	4.2	1.6	1.6
Taken a leadership role around water resource conservation in the community.	382	81.2	11.8	3.9	1.6	1.6
Attended a meeting or public hearing about water?	383	55.9	36.6	6.3	1.0	0.3

Source: Question 15; Red River Basin rural landowner survey

^aPercent

Survey question: Please rate your intentions to engage in the following actions in the next 12 months.

Table 14. Respondents' intentions to engage in actions

In the next 12 months, I intend to...	N	Mean ^a	SD	Most certainly not ^b	Probably not	Uncertain	Probably will	Most certainly will
General conservation actions								
Talk to others about conservation practices.	385	0.21	0.97	3.4	22.1	31.2	37.1	6.2
Attend a meeting or public hearing about water	387	0.15	1.02	4.7	23.0	33.3	30.5	8.5
Learn more about water resource issues in my watershed.	387	0.08	0.96	3.4	26.9	33.1	31.8	4.9
Learn more about buffer/filter strips.	384	-0.03	0.96	6.3	25.0	38.5	26.3	3.9
Work with other community members to protect water resources.	387	-0.05	0.96	4.9	28.4	38.2	23.5	4.9
Contact my watershed district/management organization about water resource initiatives.	385	-0.10	1.00	6.2	30.9	34.8	22.6	5.5
Farmer/farmland owner specific actions (respondents who use land for agricultural production only)								
Use conservation tillage on the farm.	259	0.64	1.13	6.2	9.3	23.9	35.9	24.7
Maintain buffer/filter strips along all streams and ditches.	258	0.44	1.15	7.4	12.4	27.9	33.7	18.6
Learn more about conservation drainage management practices.	261	0.15	0.98	5.7	19.5	33.7	36.0	5.0
Have land in conservation cover (e.g., Conservation Reserve Program).	260	-0.08	1.52	25.0	20.0	17.3	13.5	24.2
Plant trees as windbreak on the farm	261	-0.11	1.18	13.8	23.8	33.0	19.2	10.3
Learn more about MN Dept. of Agriculture's Ag Water Quality Certification program.	261	-0.13	1.01	8.0	28.4	36.8	21.8	5.0
Install tile drainage systems on the farm.	261	-0.62	1.24	32.6	22.6	25.7	12.6	6.5

Source: Question 16; Red River Basin rural landowner survey

^aResponses based on a five-point scale from most certainly not (-2) to most certainly will (+2)

^bPercent

Survey question: To what extent do the following individuals or groups would influence your decisions about conservation?

Table 15. Individuals or groups that influence landowners' decisions about conservation practices

	N	Mean ^a	SD	Not at all ^b	Slightly	Moderately	A lot	Don't know/Not applicable
My family	385	2.83	1.07	14.3	20.5	27.3	33.2	4.7
Farmers	384	2.70	1.03	15.4	21.6	32.8	24.0	6.3
My neighbors	382	2.58	0.98	14.9	28.0	32.7	18.3	6.0
My county's Soil and Water Conservation District	382	2.50	0.97	16.5	28.5	32.2	15.4	7.3
My local watershed district/ watershed management organization	381	2.30	0.95	19.9	36.2	24.7	11.5	7.6
The Farm Service Agency	382	2.28	1.02	25.9	25.1	27.2	11.8	9.9
The MN Department of Agriculture	378	2.19	0.96	24.6	33.3	22.2	9.8	10.1
The MN Department of Natural Resources	380	2.08	1.00	32.1	28.7	19.5	9.7	10.0
My agronomist/agricultural advisor	376	2.03	1.06	36.7	18.4	19.9	9.8	15.2
My local MN extension agent	381	2.02	0.94	32.5	27.8	22.0	6.0	11.5
University researchers	379	2.00	0.95	33.2	28.2	20.6	6.3	11.6
The MN Pollution Control Agency	380	1.93	0.96	36.8	30.3	15.0	7.6	10.3
Environmental advocacy organizations	380	1.84	0.94	42.4	25.8	16.6	5.8	9.5
Certified crop advisors (CCA)	380	1.84	1.01	43.4	20.0	14.5	7.6	14.5
Seed/input dealer	379	1.70	0.92	48.5	20.3	12.9	4.7	13.5
My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	382	1.69	0.91	49.7	23.3	11.8	5.2	9.9
My local co-op	382	1.68	0.90	47.9	22.8	11.0	4.7	13.6
Agricultural commodity associations	379	1.59	0.81	49.6	23.0	9.5	2.6	15.3
My county's Farm Bureau	381	1.56	0.81	52.2	20.7	9.7	2.6	14.7
Farmer's Union	382	1.50	0.81	55.5	18.8	6.8	3.4	15.4
Other (e.g., friends, renter, tribal government)	14	3.64	0.63	0.0	7.1	21.4	71.4	0.0

Source: Question 18; Red River Basin rural landowner survey

^aResponses based on a four-point scale from not at all (1) to a lot (4)

^bPercent

Survey question: To what extent do you agree or disagree with the following statements?

Table 16. Respondents' perceptions about their own and their community's ability to protect water resources.

	N	Mean ^a	SD	Strongly disagree ^b	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
My use of a conservation practice contributes to healthy water resources.	390	1.03	0.80	.8	2.3	18.7	49.5	28.7
I have the knowledge and skills I need to use conservation practices on the land.	389	0.76	0.91	1.8	6.9	24.9	46.3	20.1
Farmers in my community have the ability to work together to change land use practices.	388	0.59	0.98	2.8	10.6	27.8	42.5	16.2
If I wanted to, I have the ability to change the way I use the land to protect water resources.	390	0.35	1.00	4.4	13.8	35.6	34.4	11.8
I have the financial resources I need to use conservation practices on the land.	389	0.04	1.09	9.8	20.6	33.7	28.3	7.7
My community has the leadership it needs to protect water resources.	389	-0.05	1.01	9.3	19.8	42.9	22.6	5.4
My community has the financial resources it needs to protect water resources.	388	-0.14	1.01	10.1	23.2	42.8	18.8	5.2
I have the equipment I need to adopt a new conservation practice.	387	-0.22	1.04	12.9	25.1	37.2	21.2	3.6
I <u>do not</u> have the time to use conservation practices	385	-0.44	0.89	13.0	29.6	47.5	7.8	2.1
What I do on the land <u>does not</u> make much difference in overall water resource health.	391	-0.59	1.18	25.3	35.5	16.6	17.6	4.9

Source: Question 11; Red River Basin rural landowner survey

^aResponses based on a five-point scale from strongly disagree (-2) to strongly agree (+2).

^bPercent

Survey question: To what extent do you agree or disagree with the following statements?

Table 17. Respondents' views about factors that would enhance their conservation practices

I would be more likely to adopt or continue to use conservation practices on my land/property if...	N	Mean^a	SD	Very unlikely^b	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely
Conservation program requirements were less complex.	377	0.71	0.89	2.4	2.4	36.3	39.5	19.4
I had access to cost share resources to help me adopt conservation practices.	375	0.70	1.04	4.5	6.7	25.9	40.0	22.9
I could get higher payments for adopting conservation practices.	376	0.69	1.08	5.9	4.0	30.9	33.8	25.5
I had evidence that the conservation practice improved water resources.	377	0.58	0.87	2.9	4.0	38.5	41.9	12.7
I was compensated for lost crop production because of conservation practices.	374	0.55	1.12	7.5	5.1	34.8	29.9	22.7
I could learn how to maintain conservation practices for soil conservation.	377	0.47	0.85	3.4	4.2	43.0	40.6	8.8
Conservation programs were more flexible.	373	0.47	0.87	3.2	5.6	42.1	39.1	9.9
I had evidence that conservation practices <u>did not</u> reduce crop yield.	378	0.46	0.93	3.7	3.7	51.1	25.9	15.6
I could learn how to maintain conservation practices for erosion control.	377	0.45	0.87	4.0	4.5	43.0	39.3	9.3
I knew more about the wildlife benefits of conservation practices.	375	0.43	0.99	5.1	9.9	33.6	40.3	11.2
I knew more about how to implement and maintain conservation practices.	377	0.38	0.89	4.5	7.4	40.1	41.1	6.9
I had help with the physical labor of implementing and maintaining conservation practices.	374	0.37	0.97	5.1	9.1	39.8	35.3	10.7
I could talk to other landowners or farmers who are using conservation practices.	377	0.36	0.88	4.0	8.5	41.6	39.5	6.4
My neighbors maintained conservation practices.	374	0.33	0.87	4.3	7.8	44.1	38.0	5.9
I could attend a workshop or field day on conservation practices.	377	0.17	0.98	8.2	10.1	44.3	31.3	6.1
There were regulations that mandated using a conservation practice.	375	-0.01	1.17	16.0	12.0	38.4	24.5	9.1
I could be enrolled in a registry program that recognizes local conservation stewards.	377	-0.21	0.98	13.8	15.1	53.3	13.8	4.0

Source: Question 20; Red River Basin rural landowner survey

^aResponses based on a five-point scale from very unlikely (-2) to very likely (+2)

^bPercent

Survey question: To what extent do you support or oppose the following potential water resource management actions in Minnesota?

Table 18. Respondents' perceptions about management actions to protect water resources

	N	Mean ^a	SD	Strongly oppose ^b	Somewhat oppose	Neither oppose nor support	Somewhat support	Strongly support
Promoting voluntary conservation practices through increased education and outreach programs.	384	0.74	0.83	1.8	2.9	30.7	48.4	16.1
Streamlining existing programs that offer financial incentives to property owners/farmers for conservation.	384	0.71	0.96	4.2	5.5	23.2	49.2	18.0
Expanding programs that offer financial incentives to property owners/farmers for conservation practices.	383	0.71	1.03	5.2	5.5	23.8	44.1	21.4
Engaging more citizens in local land use and water resource decision making.	382	0.49	0.98	5.2	5.5	38.5	36.6	14.1
Coordinating land use and water planning and management across communities at a watershed scale.	384	0.47	0.97	4.7	7.0	37.8	37.2	13.3
Conducting more water research and monitoring.	384	0.36	1.04	6.0	12.5	33.1	36.5	12.0
Enforcing existing land use laws and regulations.	384	0.24	1.12	8.9	14.3	32.6	32.0	12.2
Increasing land use laws and regulations	383	-0.57	1.17	27.9	24.5	28.7	14.1	4.7

Source: Question 22; Red River Basin rural landowner survey

^aResponses based on a five-point scale from strongly oppose (-2) to strongly support (+2)

^bPercent

Survey question: How do you use water resources in your watershed?

Table 19. Respondents' use of water resources

	N	Percent
Drinking water	289	72.6
Observing wildlife	266	66.8
Experiencing scenic beauty	223	56.0
Fishing	143	35.9
Picnicking and family gatherings	113	28.4
Swimming	97	24.4
Canoeing/kayaking/other boating	91	22.9
Irrigation	27	6.8

Source: Question 23; Red River Basin rural landowner survey

Survey question: What is your experience with programs that offer financial incentives to property owners for conservation practices?

Table 20. Respondents' experience with financial conservation incentives

	N	Percent
Not relevant for my property	66	17.5
Never heard of any	67	17.7
Familiar but not enrolled	135	35.7
Currently enrolled	110	29.1
Total	378	100

Source: Question 27; Red River Basin rural landowner survey

Subgroup comparisons: Watersheds

Table 21. Gender difference between Wild Rice and Middle Snake Tamarac (MST) Rivers watershed respondents

Watershed	Male ^a	Female ^a	Total	χ^2
Wild Rice	88.3	11.7*	100.0	8.342
MST	77.4	22.6*	100.0	

^aPercent

χ^2 Chi-square statistic for testing differences in proportions; $p \leq .01$.

*Significant difference in proportions

Table 22. Differences between Wild Rice and Middle Snake Tamarac (MST) Rivers watershed respondents in their perceived ability and barriers to adoption or continued use of conservation practices

Survey item	Watershed	N	Mean	SD	t ^c	Cohen's d ^d
Perceived ability^a						
My community has the financial resources it needs to protect water resources.	Wild Rice	233	-0.02	1.023	2.917	0.30
	MST	155	-0.32	0.953		
Motivators of conservation^b						
<i>I would be more likely to adopt or continue to use conservation practices on my land/property if:</i>						
I could get higher payments for adopting conservation practices.	Wild Rice	222	.56	1.115	-2.904	-0.37
	MST	154	.88	.990		

^aItem measured on a five point scale from (-2) strongly disagree) to (2) strongly agree

^bItem measured on a five point scale from (-2) very unlikely to (2) very likely

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 23. Differences between Wild Rice and Middle Snake Tamarac (MST) Rivers watershed respondents in the extent to which their conservation decisions are influenced by individuals or groups

Survey item ^a	Watershed	N	Mean	SD	t ^b	Cohen's d ^c
The MN Department of Agriculture	Wild Rice	200	2.05	0.93	-3.287	-0.36
	MST	140	2.39	0.97		
The Farm Service Agency	Wild Rice	199	2.13	1.01	-3.140	-0.34
	MST	145	2.48	1.01		
My local MN extension agent	Wild Rice	197	1.86	0.88	-3.634	-0.40
	MST	140	2.24	0.99		
Certified crop advisors (CCA)	Wild Rice	189	1.71	0.98	-2.682	-0.30
	MST	136	2.01	1.03		
Seed/input dealer	Wild Rice	191	1.55	0.86	-3.520	-0.39
	MST	137	1.91	0.95		
Farmer's Union	Wild Rice	192	1.40	0.75	-2.816	-0.32
	MST	131	1.66	0.88		
My local co-op	Wild Rice	193	1.53	0.82	-3.767	-0.42
	MST	137	1.90	0.96		
My agronomist/agricultural advisor	Wild Rice	186	1.87	1.01	-3.405	-0.39
	MST	133	2.27	1.10		

^aResponse on a 4-point scale from not at all (1) to a lot (4)

^bT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^cEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 24. Differences between Wild Rice and Middle Snake Tamarac (MST) Rivers watershed respondents in their adoption of practices.

Survey item ^a	Watershed	N	Mean	SD	t ^b	Cohen's d ^c
I maintain a buffer/filter strip along streams and ditches on individual fields.	Wild Rice	143	2.10	1.39	3.026	0.39
	MST	102	1.57	1.33		
I use drainage tiles on individual fields.	Wild Rice	146	0.36	0.69	2.781	0.36
	MST	102	0.14	0.47		
I protect wetlands on the farm.	Wild Rice	142	2.58	1.46	3.987	0.52
	MST	102	1.80	1.54		

^aItems measured on a 5-point scale from 0 (not at all) to 4 (in all possible locations)

^bT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^cEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Subgroup comparisons: Property size

Table 25. Number of respondents by size of property owned

Size of property owned^a	N	Percent
Small	180	62.3
Large	109	37.3
Total	289	100.0

^aSmall <300 acres

Large= 300 acres or more

Table 26. Difference between small and large landowners in the use of their land for agricultural production

Size of property owned^a	Use land for agricultural production (%)	χ^2
Small	42.0	28.297
Large	58.0	
Total	100	

^aSmall <300 acres

Large= 300 acres or more

χ^2 Chi-square statistic for testing differences in proportions; $p \leq .01$.

Table 27. Differences between small and large landowners in their perceived ability and barriers to adoption or continued use of conservation practices

Survey item	Size of property owned ^c	N	Mean	SD	t ^d	Cohen's d ^e
Perceived ability^a						
I have the knowledge and skills I need to use conservation practices on the land.	Small	170	0.58	0.98	-3.535	-0.38
	Large	166	0.92	0.80		
I have the equipment I need to adopt a new conservation practice.	Small	168	-0.42	1.04	-3.329	-0.36
	Large	166	-0.05	1.02		
Farmers in my community have the ability to work together to change land use practices.	Small	168	0.82	0.83	4.170	0.46
	Large	166	0.39	1.04		
Motivators of conservation^b						
<i>I would be more likely to adopt or continue to use conservation practices on my land/property if:</i>						
I knew more about the wildlife benefits of conservation practices.	Small	162	0.62	1.00	2.647	0.30
	Large	163	0.33	0.95		
There were regulations that mandated using a conservation practice.	Small	162	0.23	1.06	3.371	0.37
	Large	161	-0.19	1.21		
Conservation programs were more flexible.	Small	162	0.36	0.80	-3.281	-0.37
	Large	159	0.67	0.88		
I could get higher payments for adopting conservation practices.	Small	161	0.54	1.10	-3.502	-0.39
	Large	163	0.94	0.95		
I was compensated for lost crop production because of conservation practices.	Small	161	0.30	1.04	-4.899	-0.55
	Large	162	0.88	1.06		
Conservation program requirements were less complex	Small	162	0.58	0.83	-2.911	-0.32
	Large	163	0.85	0.86		
I had evidence that conservation practices did not reduce crop yield.	Small	162	0.30	0.84	-3.981	-0.44
	Large	164	0.69	0.94		

^aItems measured on a five point scale from (-2) strongly disagree to (2) strongly agree

^bItems measured on a five point scale from (-2) very unlikely to (2) very likely

^cSmall <300 acres

Large= 300 acres or more

^dT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^eEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 28. Differences between small and large landowners in the extent to which their conservation decisions are influenced by individuals or groups

Survey item ^a	Size of property owned ^b	N	Mean	SD	t ^c	Cohen's d ^d
Farmers	Small	152	2.43	1.04	-4.905	-0.55
	Large	160	2.97	0.91		
My neighbors	Small	150	2.39	0.98	-3.185	-0.37
	Large	161	2.74	0.93		
My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	Small	143	1.48	0.76	-4.157	-0.47
	Large	156	1.90	1.00		
The Farm Service Agency	Small	142	2.11	1.04	-3.239	-0.37
	Large	155	2.48	0.98		
Certified crop advisors (CCA)	Small	132	1.64	0.88	-3.653	-0.43
	Large	148	2.07	1.10		
My agronomist/agricultural advisor	Small	127	1.71	0.94	-5.336	-0.65
	Large	146	2.38	1.10		

^aResponse on a 4-point scale from not at all (1) to a lot (4)

^bSmall <300 acres

Large= 300 acres or more

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 29. Differences between small and large landowners in their adoption of practices.

Survey item ^a	Size of property owned ^b	N	Mean	SD	t ^c	Cohen's d ^d
I use conservation tillage practices on individual fields.	Small	86	1.97	1.39	-3.228	-0.45
	Large	127	2.56	1.26		
I use drainage tiles on individual fields.	Small	88	.11	.47	-2.769	-0.39
	Large	126	.35	.70		
I follow a comprehensive nutrient management plan on the farm.	Small	87	1.80	1.66	-3.460	-0.49
	Large	125	2.57	1.53		

^aItems measured on a 5-point scale from 0 (not at all) to 4 (in all possible locations)

^bSmall <300 acres

Large= 300 acres or more

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 30. Differences between small and large landowners in their civic engagement.

Survey item ^a	Size of property owned ^b	N	Mean	SD	t ^c	Cohen's d ^d
In the past 12 months about how often have you...						
Volunteered for community organizations or events?	Small	168	.82	1.076	-3.131	-0.34
	Large	165	1.20	1.165		
Attended a meeting or public hearing about water?	Small	167	.31	.525	-6.385	-0.71
	Large	164	.76	.727		
Taken a leadership role around water resource conservation in the community?	Small	165	.20	.617	-2.637	-0.28
	Large	164	.41	.843		

^aItems measured on a 5-point scale from 0 (never) to 4 (weekly)^bSmall <300 acres

Large= 300 acres or more

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Subgroup comparisons: Percent income dependent on agriculture

Table 31. Number of respondents by percentage of income dependent on agricultural production

Percent agricultural income ^a	N	Percent
Low	193	53.2
High	170	46.8
Total	363	100.0

^aLow <50% of income dependent on agricultural productionLarge \geq 50% of income dependent on agricultural production

Table 32. Difference between respondents with varying levels of percent agricultural income in their level of formal education

Percent agricultural income ^a	Level of formal education							χ^2
	Did not finish high school ^b	Completed high school	Some college but no degree	Associate degree or vocational degree	College bachelor's degree	Some college or graduate work	Completed graduate degree (Masters or PhD)	
Low	46.7	42.0*	47.1	50.0	60.3	76.2*	76.5*	19.109
High	53.3	58.0*	52.9	50.0	39.7	23.8*	23.5*	

^aLow <50% of income dependent on agricultural productionLarge \geq 50% of income dependent on agricultural production^bPercent χ^2 Chi-square statistic for testing differences in proportions; $p \leq .01$.

*Significant differences between low and high percent agricultural income

Table 33. Difference between respondents with varying levels of percent agricultural income in the use of their land for agricultural production

Percent agricultural income ^a	Use land for agricultural production (%)	χ^2
Low	41.6	49.101
High	58.4	
Total	100	

^aLow <50% of income dependent on agricultural production

Large \geq 50% of income dependent on agricultural production

χ^2 Chi-square statistic for testing differences in proportions; $p \leq .01$.

Table 34. Difference between respondents with varying levels of percent agricultural income in the number of acres owned

Percent agricultural income ^a	N	Mean	SD	t ^b
Low	171	237.34	297.30	49.101
High	149	749.85	819.56	

^aLow <50% of income dependent on agricultural production

Large \geq 50% of income dependent on agricultural production

^bT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

SD = Standard Deviation

Table 35. Differences between respondents with varying levels of percent agricultural income in their perceived ability and barriers to adoption or continued use of conservation practices

Survey item	Percent agricultural income ^c	N	Mean	SD	t ^d	Cohen's d ^e
Perceived ability ^a						
I have the knowledge and skills I need to use conservation practices on the land.	Low	192	0.59	0.94	-3.907	-0.41
	High	164	0.96	0.86		
I have the equipment I need to adopt a new conservation practice.	Low	192	0.67	1.00	-4.178	-0.45
	High	163	0.50	0.95		
Motivators of conservation ^b						
<i>I would be more likely to adopt or continue to use conservation practices on my land/property if:</i>						
I knew more about the wildlife benefits of conservation practices.	Low	184	0.65	0.96	4.188	0.45
	High	162	0.22	0.94		
I was compensated for lost crop production because of conservation practices.	Low	184	0.40	1.04	-3.259	-0.35
	High	160	0.78	1.15		
Conservation program requirements were less complex	Low	185	0.58	0.80	-3.156	-0.35
	High	162	0.88	0.92		

^aItems measured on a five point scale from (-2) strongly disagree) to (2) strongly agree

^bItems measured on a five point scale from (-2) very unlikely) to (2) very likely

^cLow <50% of income dependent on agricultural production

Large ≥ 50% of income dependent on agricultural production

^dT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^eEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 36. Differences between respondents with varying levels of percent agricultural income in the extent to which their conservation decisions are influenced by individuals or groups

Survey item ^a	Percent agricultural income ^b	N	Mean	SD	t ^c	Cohen's d ^d
Farmers	Low	170	2.52	1.05	-3.383	-0.38
	High	160	2.90	0.97		
My financial institution (e.g., financial advisor, loan officer, mortgage lender, etc.)	Low	169	1.50	0.77	-3.582	-0.41
	High	148	1.86	1.00		
The Farm Service Agency	Low	161	2.11	1.06	-2.908	-0.32
	High	155	2.44	0.97		
Agricultural commodity associations	Low	152	1.46	0.75	-2.668	-0.31
	High	144	1.71	0.85		
Certified crop advisors (CCA)	Low	154	1.58	0.90	-4.172	-0.49
	High	144	2.06	1.05		
Seed/input dealer	Low	156	1.56	0.84	-2.749	-0.31
	High	148	1.84	0.97		
My agronomist/agricultural advisor	Low	151	1.73	0.97	-5.013	-0.58
	High	143	2.33	1.09		

^aResponse on a 4-point scale from not at all (1) to a lot (4)

^bLow <50% of income dependent on agricultural production

Large ≥ 50% of income dependent on agricultural production

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 37. Differences between respondents with varying levels of percent agricultural income in their adoption of practices.

Survey item ^a	Percent agricultural income ^b	N	Mean	SD	t ^c	Cohen's d ^d
I have a drainage water management plan.	Low	89	1.04	1.39	-3.360	-0.46
	High	132	1.75	1.62		
I follow a comprehensive nutrient management plan on the farm.	Low	87	1.76	1.61	-4.296	-0.59
	High	135	2.68	1.53		

^aItems measured on a 5-point scale from 0 (not at all) to 4 (in all possible locations)

^bLow <50% of income dependent on agricultural production

Large ≥ 50% of income dependent on agricultural production

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation

Table 38. Differences between respondents with varying levels of percent agricultural income in their civic engagement.

Survey item ^a	Percent agricultural income ^b	N	Mean	SD	t ^c	Cohen's d ^d
In the past 12 months about how often have you...						
Worked with other community members to protect water resources?	Low	188	.21	.535	-4.835	-0.52
	High	162	.57	.847		
Talked to others about conservation practices?	Low	188	.71	.817	-3.224	-0.35
	High	162	1.01	.916		
Attended a meeting or public hearing about water?	Low	188	.34	.567	-5.843	-0.62
	High	162	.73	.694		
Taken a leadership role around water resource conservation in the community?	Low	188	.17	.569	-3.637	-0.39
	High	161	.46	.901		

^aItems measured on a 5-point scale from (0) never to (4) weekly

^bLow <50% of income dependent on agricultural production

Large ≥ 50% of income dependent on agricultural production

^cT-test statistic for testing differences in means. Only items with statistical differences at a significance level of $p \leq .01$ reported here.

^dEffect size statistic for measuring the magnitude of the difference between subgroups.

SD = Standard Deviation